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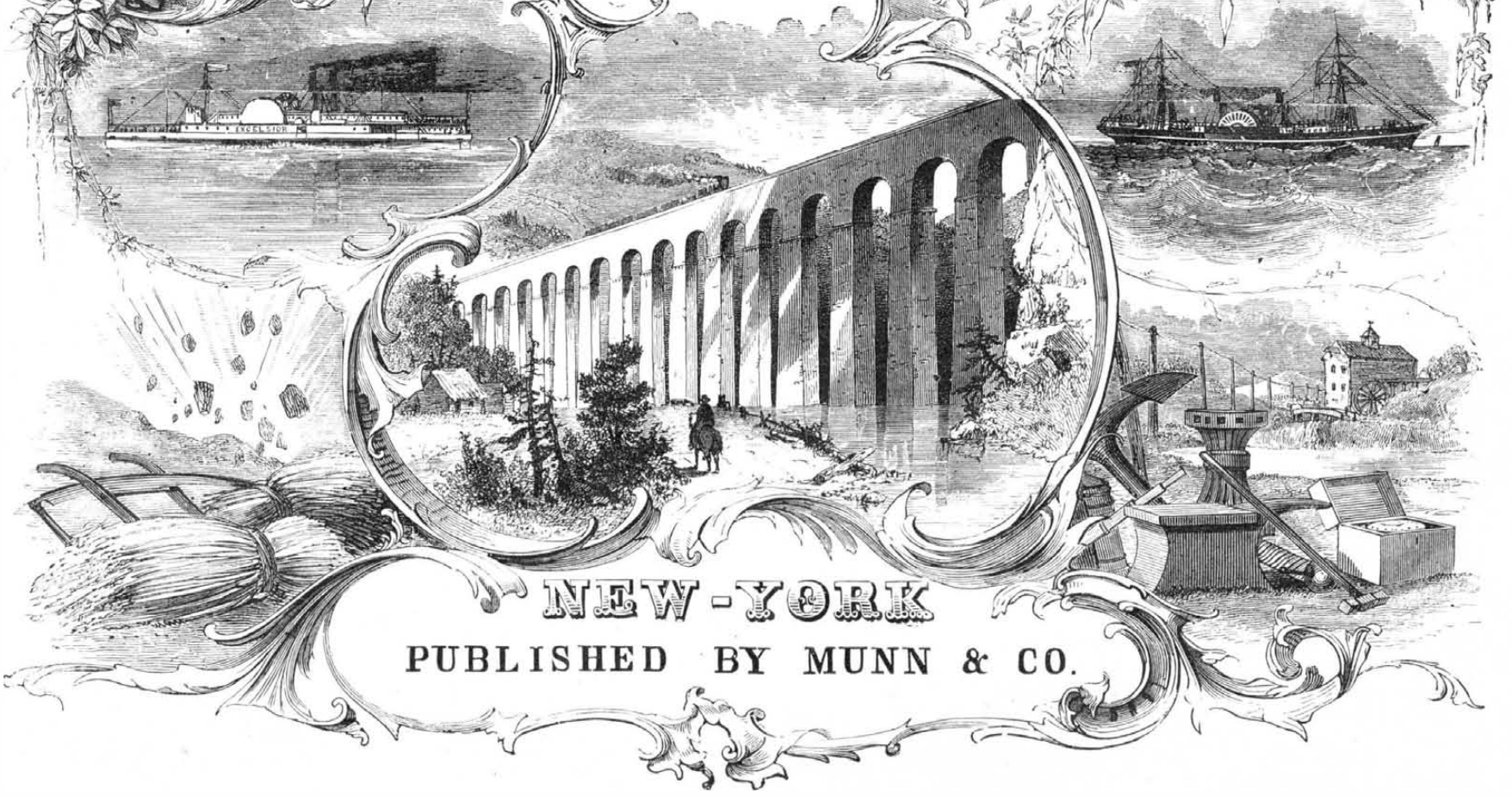

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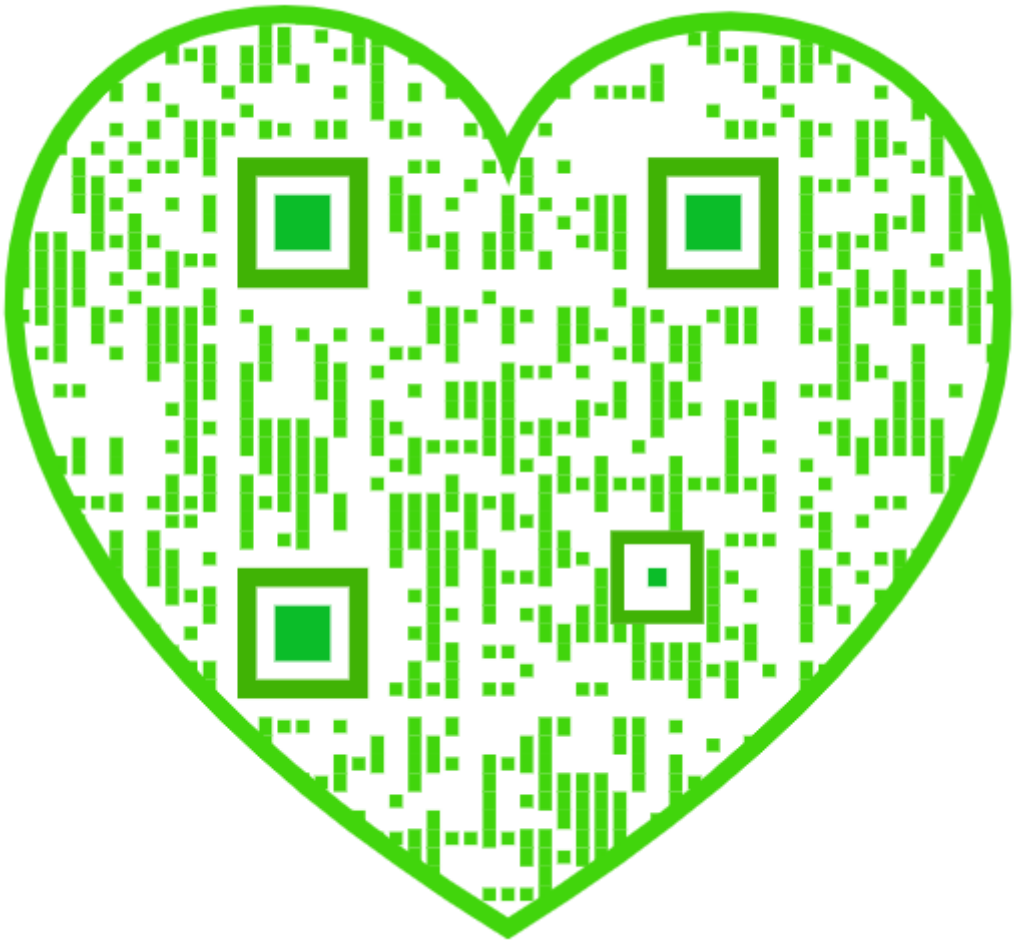

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXIX.—No. 1. [NEW SERIES.] NEW YORK, JULY 6, 1878. [$3.20 per Annum. [POSTAGE PREPAID.]

ELECTRICAL INDICATOR FOR SHOWING THE ROTATION OF THE EARTH.

BY GEORGE M. HOPKINS.

Although the apparent displacement of the plane of vibration of the pendulum had long been noticed, it was not until the year 1852 that the fact was coupled with the diurnal rotation of the earth. In September of that year M. Foucault, a distinguished French physicist, suspended a ball, by means of a fine wire, from the dome of the Pantheon at Paris, and for the first time in the history of the world made visible the rotation of the earth. The pendulum thus formed, after receiving an impulse, vibrated for many hours, and preserved its plane of vibration while the earth slowly turned under it. This splendid experiment was subsequently repeated at the Capitol at Washington, and at other places, and is now about to be again performed in Paris.

Soon after the pendulum experiment, Foucault, to illustrate the same thing, constructed a gyroscope which was a modification of Bohnenberger's machine. This gyroscope received a rotating impulse from the hand of the operator, and the momentum of the disk was depended on to continue the rotation for a sufficient length of time to exhibit the movement of the earth.

The duration of the rotary movement thus produced must have been short, and the result unsatisfactory.

Recognizing the desirability of a more practicable means of making visible the diurnal movement of the earth, I have made the action of the gyroscope continuous by applying electricity as a propelling power.

In the first engraving (which represents the machine arranged for the purpose named) the rectangular frame which contains the wheel is supported by a fine and very hard steel point, which rests upon an agate step in the bottom of a small iron cup at the end of the arm that is supported by the standard.

The wheel spindle turns on carefully made steel points, and upon it are placed two cams—one at each end—which operate the current-breaking springs.

The horizontal sides of the frame are of brass, and the vertical sides are iron. To the vertical sides are attached the cores of the electro-magnets. There are two helices and two cores on each side of the wheel, and the wheel has attached to it two armatures—one on each side—which are arranged at right angles to each other. The two magnets are oppositely arranged in respect to polarity, to render the instrument astatic.

An insulated stud projects from the middle of the lower end of the frame to receive an index that extends nearly to the periphery of the circular base piece and moves over a graduated semi-circular scale. An iron point projects from the insulated stud into a mercury cup in the center of the base piece, and is in electrical communication with the platinum pointed screws of the current breakers. The current-breaking springs are connected with the terminals of the magnet wires, and the magnets are in electrical communication with the wheel supporting frame.

One of the binding posts is connected by a wire with the mercury in the cup, and the other is connected with the standard. A drop of mercury is placed in the cup that contains the agate step to form an electrical connection between the iron cup and the pointed screw. The instrument is covered with a glass shade to exclude air currents, and the base piece is provided with leveling screws.

The current breaker is contrived to make and break the current at the proper instant, so that the full effect of the magnets is realized, and when the binding posts are connected with four or six Bunsen cells the wheel rotates at a high velocity.

The wheel will maintain its plane of rotation, and when it is brought into the plane of the meridian the index will appear to move slowly over the scale in a direction contrary to the earth's rotation, but in reality the earth and the scale with it move from west to east, while the index remains stationary, or nearly so.

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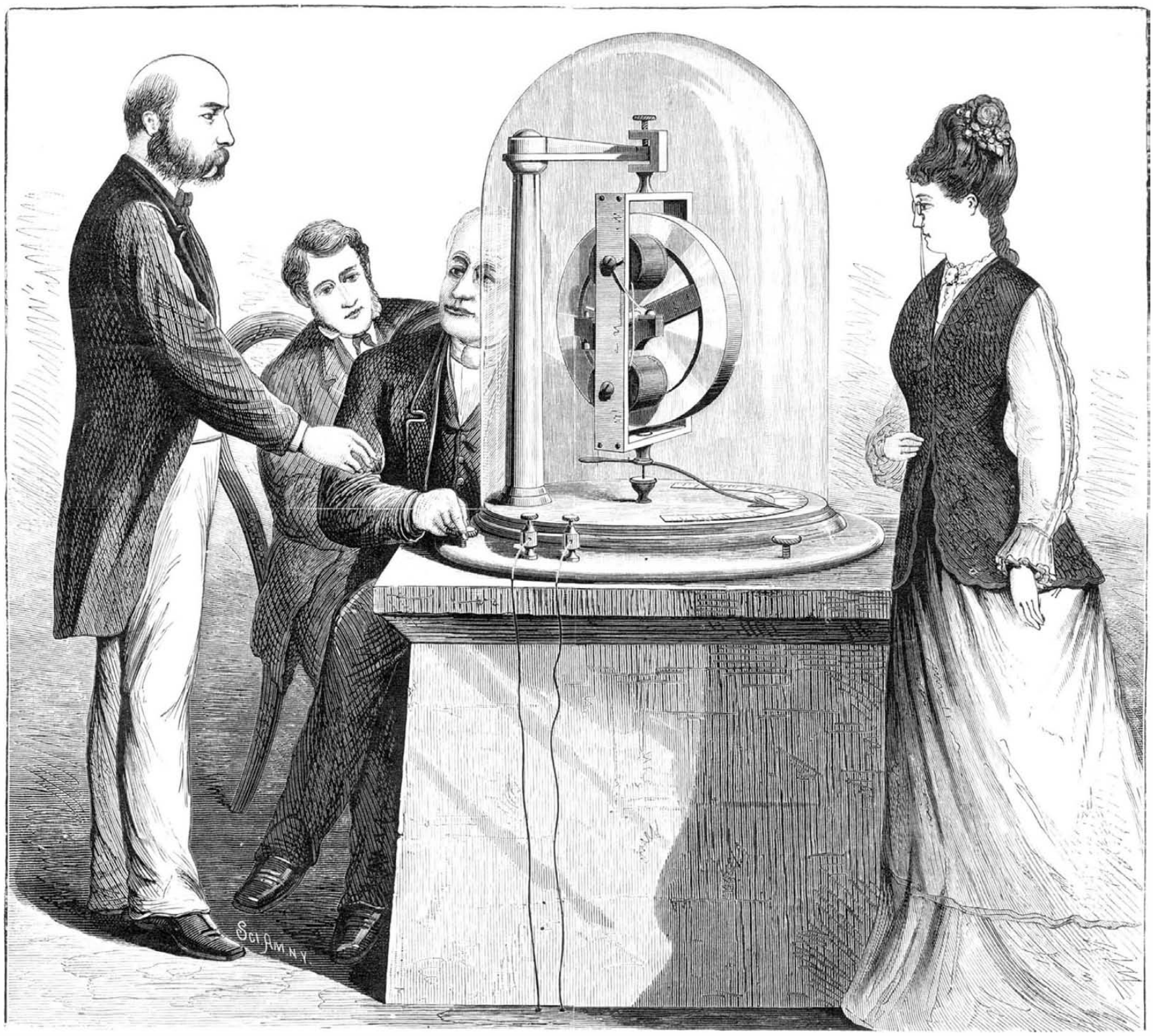

ELECTRICAL INDICATOR FOR SHOWING THE ROTATION OF THE EARTH.

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VOL. XXXIX., No. 1. [NEW SERIES.] *Thirty-third Year.*

NEW YORK, SATURDAY, JULY 6, 1878.

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IV. CHEMISTRY AND METALLURGY.—Contributions to Blowpipe Chemistry. By P. CASAMAJOR. A paper read before the American Chemical Society. No. I. New Blowpipe Bellows. 3 figures. Constant Pressure. Spring Catch. Water Trap.—Absorption of Carbonic Acid.—Determination of Vapor-densities.—Food.—Formic Acid.

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VI. NATURAL HISTORY, GEOLOGY, ETC.—The Canons of the Colorado. From the Report of J. W. Powell, Geologist in charge of the survey of the Territories. The Grand Canon, the Kaibab Fault, the Uinkaret Mountains, and other wonderful formations, and the agencies to which they owe their existence. Surface corrosion in moist and in arid climates. Altitude, and how it determines the character of a region. With 8 engravings of remarkable scenery, island monuments, Glen Canon, 4 views of Grand Canon, Winnie's Grotto, Sumner's Amphitheater, etc.
American Archæology. Proposed illustrated work on American Archæology by the Smithsonian Institution, including ancient mounds and shell heaps, cave and cliff dwellings, masonry, sculptured slabs or carved images, inscriptions and rock paintings, graves and cemeteries, aboriginal quarries and salt works, caches, workshops, etc. Ancient roads or trails, and reservoirs and aqueducts. Information wanted on these subjects, and questions addressed to the inhabitants of America, with special memoranda and instructions to explorers. A call for specimens for the National Museum.
Forest Tree Borers. By MARY E. MURTFELDT. The wood-boring beetles. The bark borers. The wood weevils. The saw-horn. The long horn or Capricorn beetles. Insects destructive to hickory, walnut, oak, elm, beech, prickly ash, pine. The twig-girdler. How Nature checks the ravages of wood-boring insects. Parasitism. Flies, birds, and other exterminators. Protection of trees about dwellings.—The Fire Bush.

VII. CHESS RECORD.—Biographical Sketch and Portrait, with one Problem, of G. N. Cheney, Syracuse, N. Y.—Rousseau as a Chess Player.—Frank Leslie's Problem Tournament of 1858.—Letter Problem.—Problem by J. H. Morrison.

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THE ELEVATED RAILROAD NUISANCE.

The steam elevated railroads in this city are amply fulfilling the predictions of those who, like ourselves, have maintained that they were not suited to the needs of rapid transit here, and would, in all probability, be found an oppressive nuisance. On both lines accidents have recently occurred with alarming frequency. Two persons have been killed falling from the Metropolitan structure within the last few days. A workman had his head nearly cut off by a locomotive while painting the iron work. Sparks falling from a furnace-have set fire in one case to bales of cotton, and in others to awnings in the street below, and several persons have been struck and injured by objects falling from merous runaways, and one person was seriously injured while riding on a street car through his leaning out and striking one of the supporting pillars of the road above. On the New York Elevated line a terrible disaster, which would have involved the precipitation of a whole train filled with passengers upon the sidewalk beneath, was so narrowly escaped that the public will feel a natural trepidation in passing over such portions of the aerial lines as are not provided with guard fences. Some mischievous boys, taking advantage of the ladders formed by the lattice-work pillars, climbed up to the track and placed heavy paving stones on the rails. The train was greatly shaken, but fortunately the guard rails kept it on the track and prevented its destruction. This is only the beginning of a probably long chapter of serious disasters, and it is suggestive to remember that the line on which nearly all have occurred is less than five miles long, and has been in operation but three weeks. How many people the elevated railroad companies propose to kill or injure daily after their whole forty miles of road is in operation, the long-suffering citizens of this metropolis will discover in course of time.

This, moreover, is but one class of the nuisances chargeable to the elevated system. Many of the most determined adherents of the Metropolitan road, while it was still in embryo, now are loud in their denunciations of the annoyances to which it subjects them. Nothing whatever has been done to reduce the deafening racket of the trains as they thunder over the resounding iron bridge, every sound-vibration of which is intensified and reflected downward by the huge sounding boards afforded by the car bottoms. Not content with throwing sparks, carbonic acid gas, and smoke into windows, necessarily kept open during the hot weather, the companies supply a detestable grade of coal especially rich in sulphur, and the result is that the unfortunate dwellers along the route, as well as the passengers, are nauseated by the stenches of sulphureted hydrogen. It is like putting a foul chimney in front of every one's bedroom window.

The management of the new line are profuse in promises of what is going to be done, and the urgent necessity for improvement begets the strong hope that their efforts will amount to something more than empty words. At the present time cars are run not nearly approaching sufficiency in numbers to accommodate the travel. And they are packed so full that the trip from terminus to terminus, about four and a half miles, frequently occupies, including stops, forty minutes. This is practically no improvement on the horse cars.

The only remedy for all these dangers and nuisances is to sink the tracks. This had to be done, and public opinion compelled it, on the Fourth avenue surface road, and the present underground line is a grand success. The Metropolitan road can put its iron tunnel under ground as well as above it. The present girders which support the rails can serve as the roof, and the track can be laid on the bottom of the cut. As matters stand now, the citizens of New York are receiving sparks, dirt, stenches, a deafening racket, dark, damp and obstructed streets, depreciated property, danger of trains leaving the track, and danger from runaway below, in return for valuable franchises for which not a cent is paid, too high rates of fare, and for the privilege of being packed in cars like cattle and slowly transported over a limited portion of the city.

STEAM BOILERS.

The relative advantages of steel and iron for boilers have been the subject of much discussion and experiment, by which the superiority of the former, in respect to strength and durability and the advantage in weight, has been clearly established; but its claims to superior economy do not seem to have been so convincingly advocated as to induce its substitution, in any considerable degree, for iron.

Most of the users of boilers are ready to admit that the steel boiler is more durable and less liable to fracture and explosion because of the homogeneity of the metal, but they are not sufficiently assured that these advantages offset its higher cost.

The hard times, too, intensify their disinclination to any change, and especially to the spending of time and money on experiments. Consequently iron boilers, notwithstanding their defects, still hold their prominent position as steam generators.

Knowing that suggestions which may result in greater safety to life and property, or to economy of manufacture, are of especial value now, and therefore pretty sure to be well received, we call attention to certain experiments that were made not long since, to determine the heat-transmitting powers of iron and steel boiler plates, feeling certain that our doing so will induce thorough investigation into the matter on the part of the manufacturers of each kind of plate.

Studying carefully the reports of boiler tests, and with some experience in such matters themselves, Messrs. Whelpley & Storer formed a theory respecting the causes of many of the discrepancies which were found in the services of boilers, and instituted a series of experiments to demonstrate its correctness.

Though conducted on a small scale the experiments were made with great care, and were repeated and continued through several weeks.

Thirteen pieces of boiler plate, of uniform thickness and a foot square, were obtained from manufacturers and boiler makers. Three of these were of Siemens-Martin steel and the others of iron.

to one face of each plate, forming a receptacle for a measured quantity of water.

Each plate, holding water of ascertained quantity and temperature, was then, in turn, placed over the carefully adjusted flame of an oil stove, and the time of evaporation noted.

As constant a temperature as possible was maintained throughout the experiment, and registered by a high grade thermometer, with bulb secured just under the lower surface of the plate.

All possible precautions were taken to secure like conditions in each case and to eliminate all causes of error.

In the first instance, each plate was tested in the condition in which it was received, then with the under surface brightened, and then blackened with lamp-black.

The mean of the results established that the Siemens-Martin steel possessed a heat-transmitting power—determined by evaporation of water at the pressure of the atmosphere—about 25 per cent higher than the mean of the iron plates; that the evaporation of the poorest steel plate was about 15 per cent higher than that of the best iron, and that the best plate of steel evaporated 40 per cent more water in a given time and under like conditions than the poorest of the iron.

The qualities of the steel plates were very nearly alike, while in the iron plates there were great variations in quality.

The cause of these differences was now sought by analyses of the plates, and Messrs. Whelpley & Storer held that absolute proof of the correctness of their theory was thereby established, to wit: that the presence or absence of non-conducting substances—cinder, oxides of iron, and other impurities—determines the heat-transmitting power, and consequently, in a great measure, the relative values of iron and steel for boilers.

The steels, owing to their mode of manufacture—the cinder separating from the molten metal—were practically free from non-conducting substances, while the irons, from which all such impurities cannot be eliminated in the process of manufacture, varied in their values according to the percentage of cinder and other foreign matters remaining in them. Of the irons the charcoal iron stood highest.

These novel experiments appear to demonstrate that, in conjunction with superior safety, great saving in fuel may also be assured by the use of steel for steam generators—a saving so considerable that it would soon offset the difference of cost between steel and iron.

PROGRESS OF OUR WESTERN INDUSTRIES.

The manufacturing interests of the West are remarkable in many respects, not the least remarkable being their rapid development and their dependence on patented inventions. A few years ago it was thought that the fertile States north of the Ohio and the Missouri were a paradise for farmers, but never could be other than agricultural in character. Even yet there are few persons who do not receive with surprise and incredulity any reference to that region as one pre-eminent for its manufacturing industries, notwithstanding the fact discovered by the census of 1870, that at that time the manufactured products of Ohio, Indiana, Illinois, Missouri, Iowa, Minnesota, and Wisconsin exceeded the agricultural products of those States by $76,000,000 a year. Since then the manufacturing interests of the West have increased with a rapidity positively amazing; and unlike the great factories of the East, very few Western establishments are engaged on standard products made by time worn processes. In almost every case they are based on recent patents.

As an illustration of Western growth, take the city of Springfield, Ohio, to which the *Graphic* of June 10 gives a double page of illustrations. Fifteen years ago it was simply a pleasant inland town without any specially promising aspect. To-day it is one of the handsomest cities in the State, with a multitude of manufacturing establishments, turning out products to the amount of $10,000,000 a year. These varied interests the *Graphic* reporter finds in a highly prosperous condition. "Neither the business men nor the manufacturers wear long faces. Their wares find sale in every part of the United States, and the 'Champion City' is well known as one of the leading manufacturing points in the West, and as having played an important part in securing for Ohio her enviable reputation throughout the world as the home of inventive genius and skilled mechanical labor."

The leading industry of Springfield is grouped around the champion reaper and mower, to the production of which a capital of $7,000,000 is devoted, giving employment to thousands of men, requiring five mammoth manufactories to do the work, and all taxed to the utmost to meet the demands of their customers. In addition the *Graphic* enumerates nearly a hundred manufacturing establishments, some

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twenty or more of which employ capitals ranging from $100,000 to $1,200,000. A wide range of products are turned out, including agricultural machinery and implements, steam boilers and engines, turbine wheels, burial cases, household and other furniture, carriages, malt liquors, iron railings, bread stuffs, cut stone, oils, soap, brick, sewing machines, gray iron castings, wind engines, tin, copper, and sheet iron ware, galvanized iron, pumps, wringers, churns, etc.

THE DECLINE OF THE WHALING INDUSTRY.

It has been often said that if whaling could profitably be followed in the highest Arctic regions, the attainment of the Pole would be an almost immediate consequence. Both North and South, whale fishermen have been the pioneers, and exploring expeditions have followed them, and it is not one of the least sources of regret, now that the whaling industry of this country has declined to meager dimensions, that these bravest of seamen will no longer open the way through uncharted seas, or make known to civilization the remotest quarters of the globe.

For the year 1876 the total value of the importation of oil and bone amounted to but $2,639,463. This is the lowest recorded total since 1829, and it is about one fourth of that for the year 1854. In 1845, 731 vessels, aggregating 233,149 tons, were employed in the trade. In 1876 there were but 172 vessels, and the total tonnage was 37,828 tons.

It will at first sight be considered remarkable that so profitable an industry should have met with a decline which is amounting to a virtual abandonment. The "History of the Whale Fishery," by Mr. Alexander Starbuck, which we find embodied in the recent report of the United States Commissioner of Fish and Fisheries, gives a large number of instances where the voyages of whaling vessels have been attended with colossal profits. The most extraordinary voyage ever made is stated to be that of the Envoy of New Bedford, which sailed in 1848. This vessel returned from a cruise and was condemned as worthless, but her owner decided to fit her up for another trip at a cost of $8,000. The result of the voyage was a profit of $158,450. The Pioneer of New London, worth with her outfit $35,800, sailed in June, 1864, and returned in September, 1865, with oil and bone worth $150,000. On the other hand, there have been many enormously heavy losses, such as those accruing from the beleaguering of whole fleets in the ice of the Arctic regions in 1871 and 1876.

Yet when all the advantages of the whale fishery are summed up, the exploration of unknown regions, the education of a skilled and hardy race of seamen, the support of the sperm candle industry, besides the profits we have indicated, it will appear that the benefits gained were large, and that the decline of the trade may be viewed as a loss in more ways than one. Still, when the causes which have led to this result are considered, it will be seen to have been inevitable. The development of the Pennsylvania coal oil resources, occurring at a time when the expense of procuring whale oil was yearly increasing, proved the most powerful of the antagonistic . . a es emse ves ecame scarcer, and it is said shyer and more difficult to capture, so that the length of the voyage has become entirely disproportioned to the quantity of oil returned. The Government, by the abandonment of sperm oil in favor of coal oil for light houses, is aiding in hastening the abandonment of the pursuit; and in addition to all these reasons are those of the increased cost of fitting out and refitting vessels and the difficulty in procuring good crews.

TRANSMITTING POWER BY ELECTRICITY.

The Société du Val d'Osne has an electro-plating establishment in Paris, where a process of coppering cast iron is carried on. The source of electricity is a Gramme machine, ordinarily run by a special engine at considerable expense and trouble, as it was situated at considerable distance from the main motor. M. Cadiat suggested the use of two Gramme machines, one to be connected to the driving shaft of the works, and to produce a current which should set machine No. 2 in motion, and this in turn might drive the machine which supplied current for the baths. Motive power was thus transmitted over a distance about 400 feet by means of a single copper wire. The system, says M. Cadiat, in *La Nature*, has worked perfectly and uniformly for two months. The velocity can be easily regulated by interposing resistance in the circuit. If, in the circuit from machine No. 2 to the electro-plating machine, a copper wire 6·4 feet long and 0·06 inch in diameter be inserted, the velocity falls from 750 to 40 turns per minute; with an iron wire 4·8 feet long and 0·32 inch in diameter, the velocity is reduced to 100 turns. As for the power required, the author states that the starting or stoppage of the system is not recognizable by the engineer who controls the driving engine of about 10 horse power, from which power is also taken for a variety of tools.

Native Magnesium Salts.

We have lately received a small specimen of nearly pure magnesium sulphate—epsomite. It is stated that a deposit of this salt has lately been brought to light on the Tennessee river near Shell Mound, about twelve miles from Chattanooga. The deposit is 31 inches thick, but not entirely clear. Small masses of this substance have heretofore been found in both Sevier and Morgan counties (Safford's Rep., 113). A deposit of magnesium sulphate mixed with chloride has also lately been discovered, according to Dr. Pontz, on the line of the Union Pacific Railroad, near Omaha.

SCIENTIFIC AMERICAN EXPORT EDITION FOR JUNE.

In our advertising columns of this issue will be found a full description of the contents of the June number of the SCIENTIFIC AMERICAN Export Edition. It constitutes a splendidly illustrated history of the progress of the world in science, invention, and the useful arts for one month. Among the prominent subjects discussed which will excite special interest are the elevated railways in New York, the new industry of brush making by machinery, Mr. Edison's wonderful carbon telegraph and heat measurer, the novelties of the Paris Exhibition, and the new electrical gyroscope. In addition to these are embodied descriptions and engravings of a large number of original and useful inventions, processes, etc., together with tables of current prices in New York and other valuable information. The advertising pages, of which there are many, contain scores of large and elegant engravings of the best American machinery, the low price at which space can be obtained enabling manufacturers to make lavish displays of their products for the benefit of purchasers abroad. The number contains ninety-three pages of the full size of the SCIENTIFIC AMERICAN, handsomely bound in covers, and constituting the most attractive and fine looking scientific and industrial publication ever issued. This splendid periodical reaches every commercial center of importance throughout the world.

THE EOTHEN ARCTIC EXPEDITION.

The schooner Eöthen sailed from New York on June 19 with an exploring party on board, which proposes to make a protracted search in the Arctic regions for the relics of Sir John Franklin and his expedition. The party is under command of Lieutenant Schwalka, U. S. A., and numbers in all seven persons, including the guide, Esquimaux Joe. Interest in Sir John Franklin's fate has been revived of late by reports that an unvisited tribe of Esquimaux has relics of those of his crew who were the last to perish. The present expedition, which has been fitted out by voluntary contributions, is intended to reach that tribe. The Eöthen is to proceed as rapidly as possible to Whale Point, Hudson's Bay, where a number of Esquimaux will be engaged. It is expected that the vessel will winter in Repulse Bay, and after the expeditionary party starts in the spring she will be used as a whaler until the party returns.

PATENT MATTERS IN CONGRESS.

The printing of the patent specifications by the Patent Office, which for some time past has been suspended owing to lack of funds, has now been resumed, Congress prior to adjourning having made the requisite appropriation.

Further consideration of the amendments to the patent laws proposed in the Wadleigh bill has been postponed until next season. Indeed, all the projects for the amendment of the law were suspended, and no changes have been made.

The Turkish Bath.

Dr. Fleming, of Glasgow, has presented to the British Medical Association an account of some experiments by the author upon himself, with a view to ascertain the effect of the Turkish bath, at the temperatures of from 130° to 170° Fah., upon the weight, temperature, pulse, respiration and secretions. The results showed that the immersion of the body in hot, dry air produced loss of weight to an extent considerably greater than normal, amounting, on the average, to the rate of about forty ounces an hour. This was accompanied by an increase in the temperature of the body and a rise in the pulse rate, with at first a fall and then a rise in the rapidity of respiration. The amount of solids secreted by the kidneys was increased, and, coincidently, the amount of urea. The sweat contained a quantity of solid matter in solution, and, among other things, a considerable amount of urea. The most important effect of the bath, however, was the stimulation of the emunctory action of the skin. By this means, the tissues could, as it were, be washed by passing water through them from within out. The increased temperature and pulse rate pointed to the necessity of caution in the use of the bath when the circulatory system was diseased.

Remarkable Locomotive Performances.

Mr. W. F. Buchanan, Superintendent of Motive Power of the N. Y. Central and Hudson River Railroad, has recently made a report on the performances of the locomotives thereon, from which it appears that the total mileage for the year 1877 on the Hudson River division was 3,726,919. The whole number of engines in service was 97, showing an average mileage for each engine for the year of 38,422 miles. The highest average for any one engine is that of No. 33, from January 1, 1877, to April 1, 1878, a period of fifteen months, when the mileage was 117,872 miles, or 7,858 miles average per month.

The United States Building at the Paris Exposition.

The London *Building News* says: The American façade is a plain wooden building of two stories. surmounted by an open belvedere in the center. The effect has been mainly obtained by paint. The style is a species of Italian, and though not particularly accurate in its details represents fairly, we believe, the sort of villa or country house to be found by thousands in the outskirts of all the principal towns in the States. Some boldly designed shields in the centers of the chief panels contain the arms of the "Keystone" State, and on a series of shields in the frieze are to be found the names of all the great manufacturing cities.

Recent Ship Designs.

Sir Edmund Thompson has recently brought out some new designs for the hulls of vessels, which deserve our attention. His first idea is that every vessel ought to be absolutely unsinkable. This it is intended to accomplish by means of air tubes and cells, a principle already employed in various degrees from bulkheading into compartments up to building double skins with dividing partitions at frequent intervals. Mr. Thompson desires to carry the principle to its utmost limit, so that, however much damage may occur to a ship, those parts not absolutely destroyed ought to float and sustain the crew. He also considers the present position of the propeller unadvisable as causing the evils of vibration, racing, slip, and injury from missiles or collisions.

Further, in the case of armor plated vessels, he advocates placing the armor plating inside the air tubes or cells, so as to lessen the amount of rolling and the liability to capsize. He proposes the use of steel throughout. His plans embrace numerous collision bulkheads forward, and the construction of a propeller tunnel in the stern, bringing the screw well within the shelter of the hull. It is proposed to guard against torpedoes by a metallic chain slung from falling davits by means of chains passing over suitable pulleys, and raised or lowered by steam hauling engines. The same plan of davits is also proposed for raising and lowering the ship's boats. The armor plating rests on a box girder shelving carried up inside from the floor of the ship, but attached to the frame.

Figures which Seem Untruthful.

Elaborate tables of the commerce of the world recently published put down the annual imports into all ports by all nations at $7,251,000,000. At the same time the exports from all ports of all nations are stated at $6,448,000,000, or a deficit of $803,000,000 less going out of all ports than is coming in at all ports.

In these tables England and Germany are put down as importing nearly $1,000,000,000 annually more than they export. Asia exports $100,000,000 more than she imports, and the United States export $200,000,000 annually more than they import.

Now the question is, Where is this deficit? Is it to be accounted for in the bills of exchange sent out to pay for imports? In this way England would needs send out bills of exchange of nearly $1,000,000,000 more than her exports each year to meet her imports, but really the balance is the other way, England receiving still more than her difference of imports and exports in interest on money than other nations.

But if so much is shown by customs records to come into port, why not show where it comes from? If America sends England a certain amount of goods, should not our record of exports to England and England's record of imports from America tally? If there is a less exact record kept of exports because they pay no duty than of imports paying duty, then what is the value of statistics? Is America exporting two or three hundred millions more than she has credit for? Is some other nation doing the same? Will Mr. Young please overhaul these statistical facts and tell us how it is?

The Hotchkiss Ship's Log.

Lieutenant D. G. McRitchie, commanding the United States steamer Tallapoosa, has recently made a report to the Navy Department relative to two taffrail logs, respectively of English and American invention. He says, after a thorough test of the American log, invented by Captain Truman Hotchkiss, of Stratford, Conn., he finds that it cannot be fouled with gulf weed or sedge, and that the dial hands cannot be tampered with. He regards it as accurate in registering distances. Its peculiarity is that the register is secured on board, while the rotator is alone towed in the water. This permits a smaller line to be used than ordinarily, and avoids the frequent breakage of the line and the loss of the log. The dial can be easily inspected at all times, even when changing the course of the vessel, without hauling in; there is consequently little danger of overrunning. The rotator is the only part of the log in danger of loss, and that can be replaced at trifling cost. There is no liability to having the log disabled or ruined, when crossing shoals, by striking the bottom, or being filled with sand.

Starting New Industries.

Illustrating the working of a tariff in a new country like the United States, we see that the manufacturers of spool cotton in Scotland have moved machinery and hands over here to Long Island and New Jersey and established the manufacture on American soil, preferring to pay taxes rather than duties. The same is true of one of the largest flax thread manufacturers in the world; they have a branch manufactory in New Jersey, employing 500 hands, but compelled to use mostly Canadian, Russian, Irish, and Belgium flax, because American flax growers are too careless of the product. In this connection we might also mention a great number of tool, machinery, and cutlery manufacturers who have established a prosperous business here.

The Telephone at Sea.

The telephone has lately been successfully used in France to communicate between a vessel being towed and one towing. The wire was carried along one of the hawsers, and circuit was completed through the copper on the bottoms of the ships and the water. Conversation was carried on very distinctly.

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HORIZONTAL CONDENSING ENGINE AT THE PARIS EXHIBITION.

We illustrate in the annexed engraving a new horizontal engine of peculiar construction, exhibited at the Paris Exhibition by La Société Anonyme des Usines St. Maurice, Lille. The framing is of cast iron, really in four pieces, but so well put together, and so clean in the joints, that it is not easy to believe that it has not been cast in two pieces, one at each side. The piston rod head is guided by a vertical parallel motion, the joints of which are made with straps and cotters on solid blocks forged in one with the rods. The upper levers of this motion are keyed on a cross shaft turning in bearings on the side frames, and on each end of this shaft is keyed a double horizontal lever. That on the right hand of the engine looking toward the fly wheel from the cylinder works two single acting vertical air pumps drawing from the jet condenser, which is seen right beneath the cylinder. The lever at the other side works two ordinary plunger pumps. On the parallel motion horizontal shaft, just noticed, are two sleeves; one of these carries a lever, which is connected with the main slide valve on the one hand, and with a crank on the other. The crank is made in a horizontal shaft, carried in bearings in two castings, one of which supports the governor. This crank shaft is driven by spur gearing from the main shaft.

Above the main slide is a gridiron expansion valve, actuated by an arm on a vertical shaft, shown at the side of the governor. On the lower end of the governor rod is a sleeve fitted with two cams. The sleeve rises and falls with the governor, the weight of which is partially balanced by the two balls supported on arms seen in the elevation of the engine. The position of the cam sleeve is controlled by the governor, and so determines the point of cut off in a way that will be readily understood. The cut off valve is worked by a second lever and sleeve rocking on the horizontal parallel motion shaft.

The whole engine is self contained in the sense that little or no excavation is required; and abnormal as the engine appears, the *Engineer*, from which we take our engraving, states that it runs exceedingly well, and compares favorably with many other engines in the Exhibition.

The admission of steam which corresponds with an effective duty of 100 horse power is stated to be one tenth of the stroke of the piston. The principal dimensions are as follows: Diameter of cylinder, 23·6 inches; stroke of piston, 3 feet 8 inches; number of revolutions per minute, 46; diameter of air pumps, 13·6 inches; length of stroke of buckets, 10·8 inches; proportion of steam cylinder to air pump, 12 to 1; diameter of fly wheel, 16 feet 9 inches; width of fly wheel, 25·6 inches.

A CORRESPONDENT suggests the construction of projectiles on the principle of the boomerang, for reaching an enemy behind earthworks or embankments. The usual way of surmounting obstacles of this sort is to make the balls ricochet or bounce over the parapet after first striking the ground.

ELECTRICAL INDICATOR FOR SHOWING THE ROTATION OF THE EARTH.

[*Continued from first page.*]

If the index were absolutely motionless the scale would move under it at the rate of 15° an hour, but owing to friction the motion of the scale or apparent motion of the index is less.

It makes no difference whether the index points northward or southward, its apparent motion is always westward, thus affording visible evidence that the earth rotates.

The instrument I have thus described may be easily modified, so as to illustrate other interesting phenomena of rotary motion.

By removing the index and point from the insulated stud at the lower part of the frame and unscrewing the supporting piece from the top of the frame, the frame may be suspended in a horizontal position upon pointed screws in a fork which is supported upon a vertical pivot, as shown in the second engraving.

Fig. 2

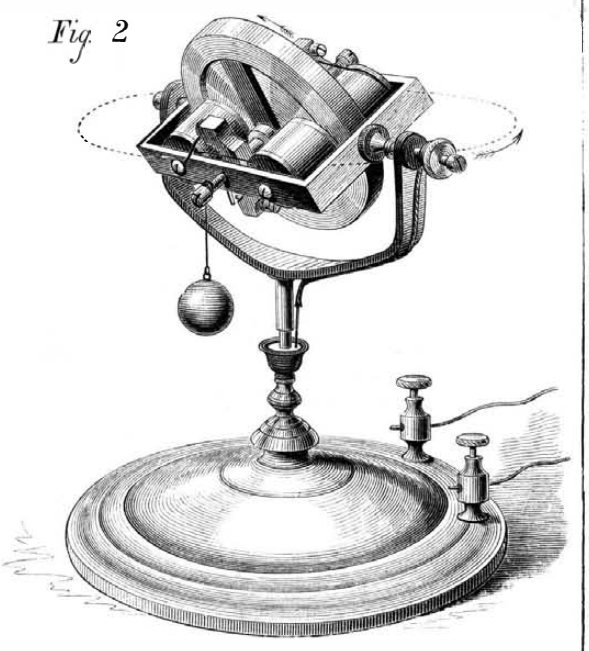


Fig. 2.—ELECTRICAL INDICATOR.
Fig. 2.—ELECTRICAL INDICATOR.

The pointed screw that enters the insulated stud is insulated, and communicates, by an insulated wire, with mercury contained in an annular vulcanite cup on the fork supporting pivot. One of the binding posts is connected with the pivot of the fork and the other communicates with the mercury in the vulcanite cup.

When the instrument is connected with a battery the wheel revolves rapidly, and if undisturbed will remain in the position in which it was started. If a small weight, such as a key, be hung upon one of the pivot screws of the wheel spindle, the frame containing the wheel does not turn quickly on its pivots as might be expected, or as it would if the wheel were not revolving, but the entire apparatus immediately begins to revolve slowly on the vertical pivot, while the weighted side of the frame descends almost imperceptibly. Transfer the weight to the opposite pivot, and while the wheel still revolves in the same direction the apparatus will revolve on the vertical pivot in the opposite direction. The rotary movement on the vertical pivot is in opposition to the friction of the wheel; that is, the apparatus if rotated on the vertical pivot by the friction of the wheel on its pivots would be in the opposite direction.

By removing the weight from the pivot screw and turning the apparatus on the vertical pivot the converse of what has just been described will result; that is, the wheel besides revolving on its own axis will turn in a plane parallel with its axis.

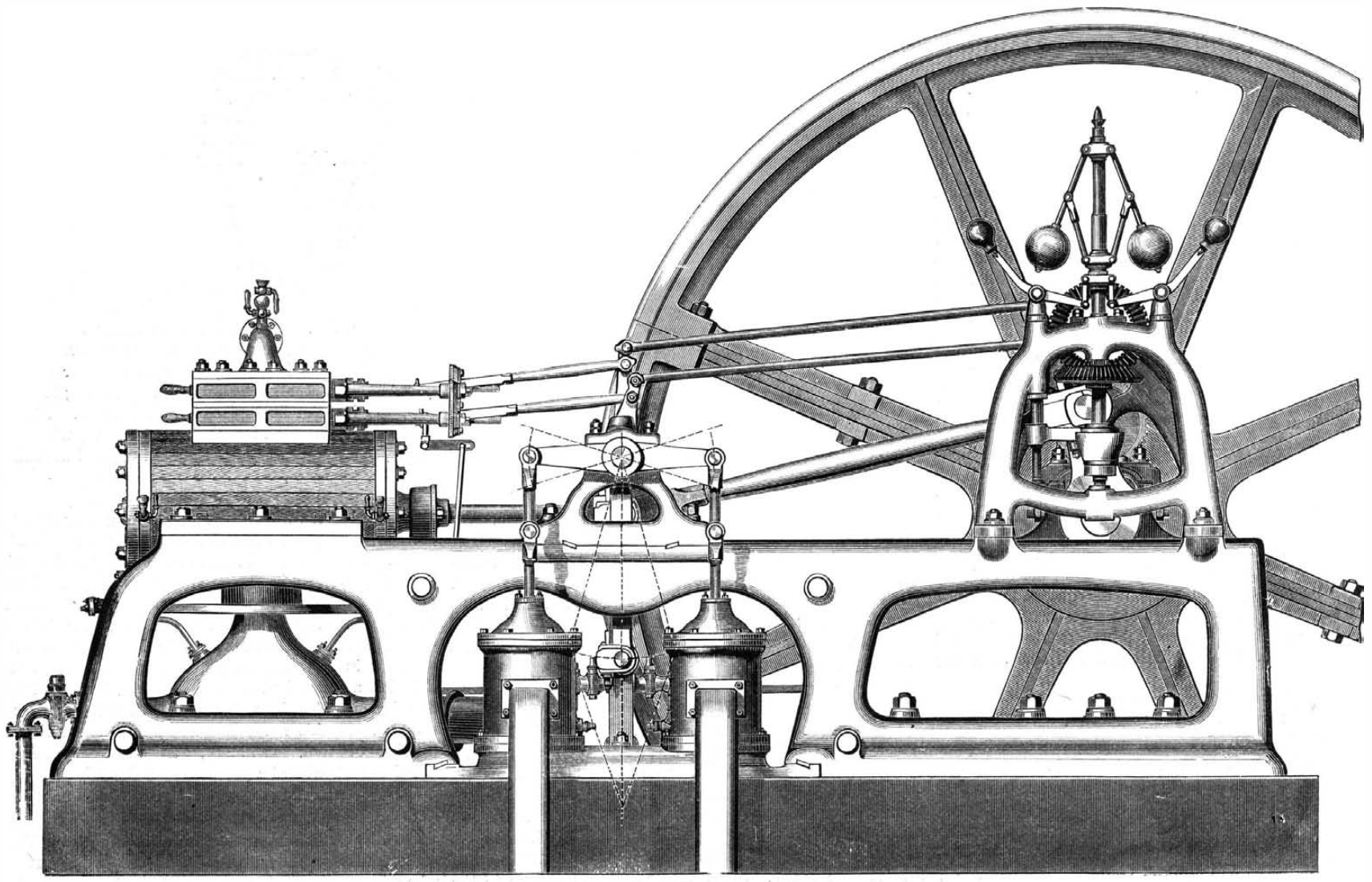
If the apparatus be turned on the vertical pivot in the opposite direction the rotation of the wheel on its new axis will be reversed, and by oscillating the apparatus on the vertical pivot the wheel and frame will revolve rapidly on the pointed screws that support the frame.

The law controlling these movements is as follows: "Where a body is acted upon by two systems of forces, tending to produce rotations about two separate axes lying in the same plane, the resultant motion will be rotation about a new axis situated in the same plane between the directions of the other two."

By means of this continuously operating gyroscope Dr. Magnus' experiments showing some of the causes of deviation of projectiles may be nicely exhibited.

Deep Boring.

A deep artesian well is being bored at Pesth, and has reached a depth of nearly 1,000 meters, over 3,300 feet. The work is undertaken by the Brothers Zsigmondy, partially at the expense of the city, which has granted £40,000 for the purpose, with the intention of obtaining an unlimited supply of warm water for the municipal establishments and public baths. A temperature of 161° Fah. is shown by the water at present issuing from the well, and the work will be prosecuted until water of 178° is obtained. About 175,000 gallons of warm water stream out daily, rising to a height of 35 feet. This amount will not only supply all the wants of the city, but converts the surrounding region into a tropical garden. Since last June the boring had penetrated through 200 feet of dolomite. The preceding strata have supplied a number of interesting facts to the geologist, which have been recorded from time to time in the Hungarian Academy of Sciences. Among some of the ingenious engineering devices invented during the course of the borings are especially noteworthy the arrangements for driving in nails at the enormous depth mentioned above, for pulling them out, for cutting off and pulling up broken tubes, and a mechanical apparatus by means of which the water rising from the well is used as a motive power for driving the drills.



HORIZONTAL CONDENSING ENGINE AT THE PARIS EXHIBITION.

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Whitening Positives.

Bichloride of mercury and other things have been suggested and tried in the process of whitening a dark positive picture, but with no good and satisfactory result. We have found a very simple and pure method by which an ambrotype or ferreotype may be whitened in the shortest time and give excellent results. The first trial was with a much under-exposed picture, which was entirely too dark. After it had been fixed and dried, we ran a stream of water over it again, in order to soften the film; we next prepared a mixture from one part of the usual developer (consisting of protosulphate of iron and acetic acid) with half a part of the silver bath, which was entirely neutral. This mixture we flowed over the picture, and after the lapse of four seconds the picture became nicely white, the half-tones appeared white, while the blacks of the darkest shades remained perfectly uninjured. The solution was now thrown off, and as a number of gray, dirty looking specks appeared on the picture, the usual fixing solution was applied to it again, by which means the picture appeared faultless, the whites being intense and of a brilliant white.

Since that time we have made the same trials with a different developer and an acid silver solution, and obtained the same excellent results. We have carried this redeveloping process further, and in the course of one minute changed a good positive into an excellent negative, which printed very good. We have tried this method with pictures which were more than half under-exposed in the camera, and did not fail in a single instance.—*Practical Photographer.*

MR. THOMAS A. EDISON.

Many of our readers will recognize in the engraving the face of Mr. Thomas A. Edison, and others, who are not familiar with his appearance, may form a good idea of how the great inventor looks. Every one is acquainted with his telephone, phonograph, and other remarkable inventions, therefore we shall not notice them here.

Mr. Edison is above the medium height, and although he is only thirty-one years old, his iron gray hair and thoughtful eye show the effects of continued study. He is genial, liberal, and entirely unostentatious. His mind, day and night, is on his projects; and even while eating his thoughts dwell on his inventions. His table conversation consists of occasional ejaculations regarding some new point in whatever project he may have in hand. He is at home in his laboratory, which is very large and complete in all of its appointments. He has a number of assistants, who are competent and quick to carry out his wishes, and they are often engaged on several widely different subjects at the same time. The experimental apparatus which is completed during the day is often tried at night when all is quiet and no visitors are present.

Notwithstanding his great mental labor, he avers that his health is good, and that as his occupation is pleasurable it does not tire him.

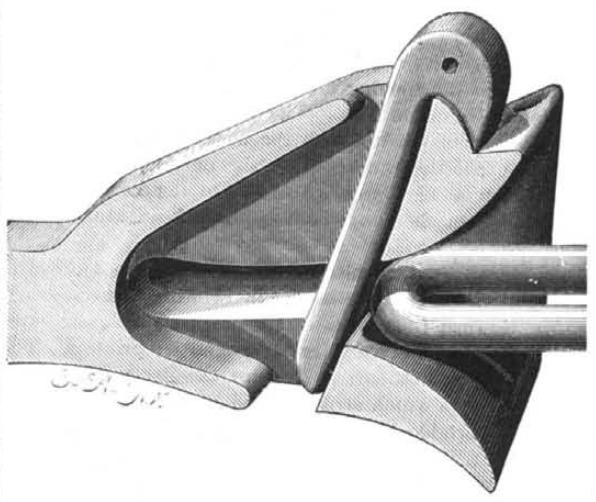
His residence and laboratory at Menlo Park are beautifully situated upon the brow of a hill that overlooks a picturesque valley. The beautiful landscape and the mountain air—Nature's best restoratives for the brain-weary—he has without the seeking.

Mr. Edison may well pride himself as to his position in the world of science, standing, as he does, first among the inventors of the day; and having, by his own energy and persistence, secured an income that enables him to carry forward on a grand scale such experiments as his prolific mind may suggest.

We publish in another column a detailed account of Mr. Edison's researches in telephony.

PATTESON'S IMPROVED CAR COUPLING.

The annexed engraving represents a new and very simple form of automatic car coupling. It will be observed that there are no more parts in the device than in the common coupling now in use, and that the operation is positive and



PATTESON'S CAR COUPLING.

can hardly fail. The shape of the interior of the drawhead is evident from the illustration. The pin hooks over a projection on top and passes down through to a slot beneath. The entering link pushes the pin back, causing it to swing on the point of the hooked portion. The lower end of the pin is thus lifted as the link passes under it, and allowed to fall back into the link opening, thus effecting the coupling by the simple action of gravitation.

Practical railway men will at once see the great simplicity and utility of this coupler as a life-saving apparatus to brakemen. The drawhead will be from 15 to 20 pounds lighter than the old one, and much thicker and stronger in front. Cars can be run closer together, as no one goes between them to couple, and shortening the length of the train will cause a more compact and less jarring pull. When coupled, the link is not cramped, and can work in every direction. The pin fits plumb in the lower part of the drawhead, and is sufficiently inclined to make the pull steady, and against the upper and thicker part of the drawhead, and cannot bounce up or be jolted out of place. An asbestos rope is put in the head of the pin and hooked to the top of a freight car, so that the brakeman can uncouple from the top of the car, or at the side of the track, without going between the cars, and can pass from car to car more easily, as the boxes will be nearer. The drawheads can be used nearly touching, by cutting the hole for the pin more to the front and correspondingly reducing the rear space and link; the front of the drawhead to be blaring and very strong, especially the upper half, which will withstand the main pull.

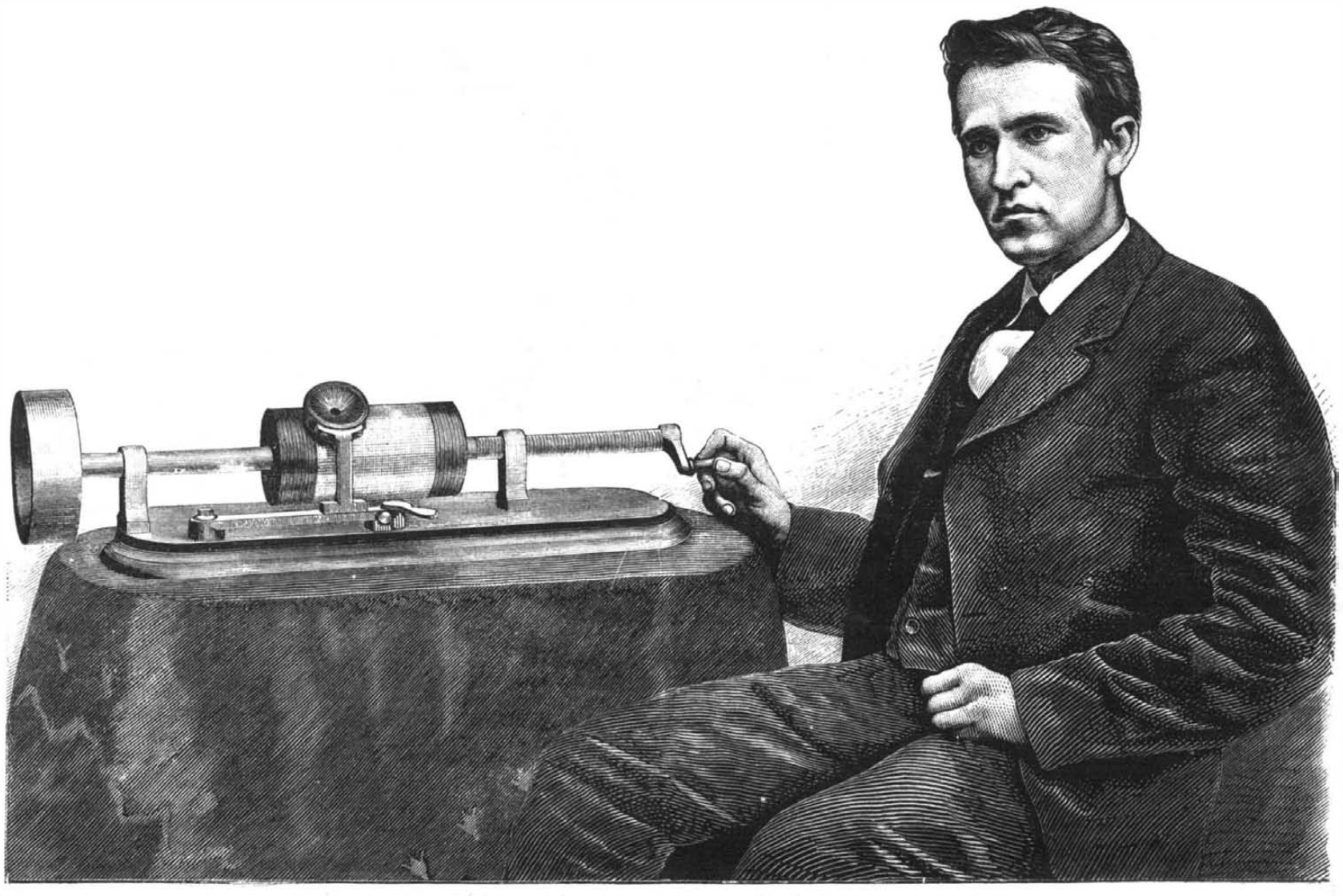
This simple automatic coupler has no springs, bolts, bars, or screws to rust, break, or get out of order, and is pronounced by many railway experts the most perfect yet invented. Patented February 26, 1878. For particulars touching its introduction, sale, etc., address E. M. Drane, Frankfort, Ky.

Project for Increasing the Water Power of Pennsylvania.

The head waters of the Pennsylvania streams are not very much higher nor are they far distant from the rapids at Niagara Falls, and the suggestion of increasing the water power of the State of Pennsylvania to an almost unlimited extent by using the power of the Niagara Falls to force a supply from the head of the rapids across to the head waters of that State is believed to be feasible. The water power which could thus be thrown into the head waters of the Ohio and Susquehanna to be used a hundred times over would be of incalculable value to that great industrial State, while its cost would be but a trifle compared with steam, more especially now that the dams and water wheels already exist. The same principle of supplying power to other streams, but by steam power, it is believed will be found feasible, especially where the stream is so rapid and the dams so numerous as to completely use the water when furnished. The water leaving the Connecticut at Holyoke, Mass., turns the water wheels for mills located upon six different terraces, so that the same water is used six times over in a distance of less than two miles.

A Japanese Built Ironclad.

A Japanese ironclad, the Li-ki, five guns, is now on her way to England, making a call at all the principal Asiatic and European ports *en route.* Unlike most of the vessels belonging to the Japanese navy, the Li-ki was built in Japan, under the superintendence and from the designs of M. Chiboudier, a French gentleman employed in the Imperial Arsenal of Yokoska. It will be remembered that the English Government lately made overtures for the purchase of three or four gunboats built in that country for Japan, but were unsuccessful in their bids for the vessels. The visit of a native-built ironclad to Portsmouth is therefore looked forward to with considerable interest. The Li-ki was built in 1874. Her length is 191 feet; breadth, 22 feet; draught forward, 11 feet; and aft, 13 feet. She has two decks, the upper one carrying five guns. The state cabin, ward-room, etc., are handsomely fitted, and the whole arrangements of the vessel are said to be very complete. Her officers are nearly all native Japanese.



THE PHONOGRAPH AND ITS INVENTOR, MR. THOMAS A. EDISON.

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A Great Public Nuisance.—The Steam Street Railways of New York City.

The noise of the trains on the Metropolitan Elevated Railway has called forth a strong protest from the residents along Sixth avenue. A deputation representing the property holders on that avenue lately waited on the president of the company, to complain of the nuisance, and to ask that it should be abated. Mr. George W. Pell, of No. 438 Fifth avenue, was the chief spokesman. He alluded to the losses likely to be incurred by storekeepers and others along Sixth avenue if the great and incessant noise which prevails at present continues. This gentleman said that while he was not personally opposed to rapid transit as it now exists, he was bitterly opposed to any company whose trains made such an awful din as do those of the Metropolitan Railway Company. Mr. Pell said that though he resided on Fifth avenue, a block distant, he and his family were considerably annoyed by the constant roar of the cars. He enumerated a score or so of churches which would probably have to be shut up if cars were run on the Sabbath, and closed his remarks by characterizing the noise at present made by the trains when in motion as a perfect nuisance, and stating that if something was not done immediately to suppress the evil complained of, the property holders on Sixth avenue would rise *en masse* and protest against such a high handed outrage. Mr. F. K. Keller, of No. 664 Sixth avenue, who keeps a large meat market under the Marlborough House, spoke next, and said that, while willing to sacrifice his property for the convenience of the general public, he was not willing to be ruined in health and business by the elevated road as it was now run. Mr. Keller remarked that when customers enter his place of business he experiences the greatest difficulty in hearing what they say, and the result is that he and those who visit his place have to shout into one another s ears. He asserted that he was under medical treatment, having so strained himself a few nights ago in attempting to make his voice audible above the din of the cars that, when he reached his residence, he spat up blood in large quantities, something which never occurred to him before in the whole course of his life. President Foster, in reply, said he thought it very strange that Mr. Pell should be in any way disturbed by the working of the road, considering that he lived a block away, in Fifth avenue. The president said that he had for several nights slept within two or three houses from Sixth avenue, and that he was not in the least troubled by the trains, though the latter passed up and down the track at a very early hour in the morning. The president admitted that an unnecessary noise was made by the cars, but contended that it was not of such a nature as to prevent sleep, or interfere with business in any way. He said that the question of running the cars with a view to making as little noise as possible is now under considera tion by the officers of the company, whereupon the deputation withdrew.—*N. Y. Times.*

One of the minor annoyances of the Gilbert Elevated road to the storekeepers on Sixth avenue has been the frequent destruction of the awnings by sparks from the passing locomotives. Spark arresters have been tried, but have proved altogether too successful, arresting not only the live cinders, but the locomotives also, by checking the production of steam. The evil might be largely reduced by making the awnings fireproof. This can be done by saturating them with solutions of various simple bodies, as common salt, alum, or borax. Sulphate of ammonia would be still more effective. For permanent awnings not rolled up, silicate of potash or soluble glass might also be used. None of these substances would make the awnings absolutely incombustible, but they would prevent them from bursting into flame, and reduce the damage from falling sparks to a minimum. —*New York Tribune.*

A recent number of *Charivari*, a French comic journal, suggests that as the mad dog season is approaching, true humanity and proper affection for the brute creation will deter their inconsiderate slaughter, and that in preference pedestrians should wear large wire shields around their shins, to ward off bites. The intelligent reader will perceive the analogy between this suggestion and that of our cotemporary.

What the South owes to New England.

New England machanics and manufacturers invented and made the first machinery for the manufacture of American cotton, and thereby made a market for the staple product of the South. Arkwright's machinery was not adapted to the use of American cotton. Slater, the pioneer in the cotton manufactures in this country, did not use American cotton in his mills in Rhode Island. He had been employed in Arkwright's mills in England, where it was not used, and the machinery, constructed from models or drawings he brought with him, was not suited to the use of American cotton. Lowell, on the other hand, used nothing but American cotton, and constructed his machinery for that purpose. By virtue of that machinery the American staple was made an article of commerce. Thus to Whitney and Lowell the South is chiefly indebted for all the prosperity derived from cotton that it has ever enjoyed. The success of American cotton fabrics in China compelled the British to use American cotton and adapt their machinery to its use. And the reason that Indian and Egyptian cotton is not now more greatly used is that English machinery is better adapted to the use of our cotton. With these and collateral facts, Hon. N. P. Banks was able to make a telling argument against the proposed change in the tariff law. Protection to the American cotton manufacturer was quite as beneficial to the cotton planter as to him. To cripple or destroy the cotton manufacturer of this country is to unsettle and injure in all markets the demand and the value of American cotton. The industry that first employed American cotton, and has since steadily maintained the demand for it, is the best and most reliable patron and protector. Said Mr. Banks: "Let the cotton planters drive the Americans out of competition with England and force the adaptation of British cotton machinery to the use of Indian and Egyptian cotton, which they describe as the best cotton of the globe, possessing all the qualities of the finest long silks of the sea islands and the short silks of Louisiana, and they will destroy the market for American cotton in this country and in Europe. Cotton is no longer king. Machinery is king. It was crowned at the American Centennial Exposition in 1876."

New Mechanical Inventions.

Mr. Thomas J. Paradine, of Erie, Pa., has patented a new Safety Valve and Cock for steam cylinders, which is so constructed that the opening of the cock takes place whenever the engine is exhausting. The water of condensation is thus allowed to pass through the upper chambered part of the valve and the exit spout to the outside, relieving the cylinder of the high pressure caused by the compression of water between the piston and cylinder head after the exhaust port is closed.

An ingenious mechanical arrangement of an Automatic Inking Device is embodied in a new Printing Press patented by Mr. Edward L. Gilman, of Somerville, Mass., and especially adapted to the use of amateurs and job printers. The same motion which carries forward the ink roller throws forward an arm which strikes a stud and releases the paper.

A new Portable Hand Windlass, whereby it is claimed two men can do work which would otherwise require eight or ten men, has been patented by Mr. Orleff Fredrickson, of New York city. The mechanism is simple and compact, and the device is well suited for nautical use.

An improved Gin Saw Filer, devised by Mr. Edward L. Harris, of Red Banks, Miss., has devices for reciprocating the file and rotating the saw. The novel features are embodied in the carriage which supports the file carrying mechanism. Ingenious means are provided for varying the angle of the teeth.

Mr. Adolphus H. Vitt, of Union, Mo., has patented a new Piston Rod Packing, which consists of recessed sectional shells and sectional brass rings arranged therein in combination with retaining springs and sleeve and end rings. This packing is claimed not to heat or abrade and to require but little lubrication.

Mr. Jacob Mackey, of Steubenville, Ohio, has devised a new Tuyere for Blast Furnaces, which is made in two parts, and is provided with closed bottoms to obviate the necessity of joints and prevent leakage.

Messrs. Joseph F. Wooldrige, Johan F. Nystran, and Lyman D. Howard, of Richmond, Va., have patented a new Lump Tobacco Machine, for giving an initial pressure to the filler of the plug before the binder is put on, and for discharging said lumps continuously and consecutively without loosening, breaking, or destroying in any way the integrity of the material.

Mr. Wm. S. Hull, of Hinds Co., Miss., has recently patented a new Screw Propeller, which is an improvement upon the screw propeller for which letters patent were granted the same inventor February 20, 1877. Said improvement chiefly consists in giving to the leading edge of the right angled triangular blade a finer pitch, or smaller angle to the plane of rotation of the blades, than the pitch or angle of the rear portion of the blade.

Mr. Thomas L. Lee, of Paducah, McCracken Co., Ky., has patented a new Dredging Machine, the new feature in which is the particular construction of the dredging cylinder, which has a body made in the form of an elongated shell, with longitudinal blades arranged upon the periphery of the same, so as to operate laterally upon the mud and sand, thus beating the same so as to uniformly impregnate the water with it.

Mr. Wm. H. Phelps, of Greenville, Meriwether Co., Ga., has patented a new Horse Power, in which the object aimed at is to attain maximum speed and power with a minimum length of sweep or lever. To this end, the inventor adopts a novel combination of gears.

Mr. David Gates, of Benwood, Marshall Co., W. Va., has patented a novel Drag Sawing Machine, which saws logs and timber into sections. A horse power gearing is attached to a wheeled frame, and the saw is detachably connected with a reciprocating cross head by means of a bolt and clevis. The saw is guided in its movement by a bar which is attached to the log.

Iridescent Glass.

The lustrous, metallic-looking glass, of iridescent quality, which has created so great a sensation of late, is, it appears from the English patent of Mr. Thomas W Webb, produced in the following manner: Chloride of tin, or tin salt, is burnt in a furnace, and the glass having an affinity for it, when hot, receives the fumes, and so at once an iridescent surface is produced. To give greater depth to the color or tints, nitrate of barium and strontium is used in small proportions. By this patent the glass is not re-heated, but the iridescence is produced during the manipulation of the article when in the hands of the blower, and while on the punty.

Fast Paper Making.

The long promised trial at the mill of Messrs. M. T. Close & Sons, Iowa City, Ia , took place on the night of May 24. Our readers will remember that this firm published a statement that on a certain date they had run 7,150 pounds of straw wrapping paper, 16 by 22 inches, 35 pounds per ream, in twelve hours on a 62 inch machine. The possibility of such a run was denied by many paper makers, among them Mr. A. Siddle, of the Clinton, Iowa, Paper Company, who offered to pay one hundred dollars to have this alleged run repeated in his presence. Messrs. Close & Sons accepted the challenge, and appointed the day, and Mr. Siddle and the editor of this paper went to Iowa City to see the test. We found a splendid machine of great drying capacity, and excellent facilities in the mill for beating the stock. The machine had been provided with a new felt expressly for the run, and everything was in good shape, with two exceptions: the river had risen so that the head was said to be some 3 feet less than when the previous great run was made, and it was claimed that the straw, which was mainly rye, with some wheat and oat, was not in good condition and contained some grain.

The run was commenced at 6 P. M., and at the expiration of twelve hours there had been made 6,615 pounds, or 189 reams, being 15 reams, or 535 pounds, short of the agreed amount. The promised feat, therefore, was not accomplished, and Mr. Siddle saved his hundred dollars, for that time at least. The run, however, as all will agree, was a very remarkable one, and probably has never been equaled. There is no question that it was conducted with the utmost fairness. There was no flax or other hard stock used, the reels were empty at the start, and the count was honestly made. To make the promised run, a speed of 83 feet per minute, without a break for twelve hours, was necessary. The machine ran from 73 to 88 feet a minute, and Mr. Close claims that if the head of water had been at the best, and breaks had not been caused by poor stock, he could easily have done what he claimed. Indeed, he says that some time he will run 8,000 pounds in the same time.

In view of the disadvantageous circumstances Mr. Close claims that he is entitled to another trial for the hundred dollars, and he asks the opinion of paper manufacturers through the *Western Paper Trade* as to whether he is not entitled to it. What do our readers say? Mr. Siddle's challenge did not limit the offer to one trial, but asserted the run alleged could not be made, and if he is of the same opinion he will probably be willing to back it up at another trial. Certainly all of our readers would like to know whether such a run can be made.

One thing is certain: the reports of fast runs which we have made from time to time have had the effect to show many paper makers that they were not working their machines to their full capacity, and many of them have materially increased their daily product. The more paper each manufacturer can make without increasing his machinery or expenses, the better off he is—providing, of course, that he sells for more than cost, as everybody is supposed to do, and we expect to learn of a pretty general increase in the production of our mills, when it is deemed desirable. Let us hear what others can do now.—*Western Paper Trade.*

Effect of Gas on Cotton Goods.

At the last meeting of the Chemical Section of the Philosophical Society of Glasgow, Dr. William Wallace, Gas Examiner and Public Analyst for the city of Glasgow, read a short paper on the destruction of the color of cotton goods by the sulphur in the gas burned in the London warehouses. Sulphuric acid, he said, was found in considerable quantity in the goods after being some time exposed, while the same articles in the fresh condition were quite free from that acid. In some cases the cotton fiber itself was rendered so tender as to be perfectly useless. The same thing had been observed in the warehouses in several large towns in England, such as Leeds, Manchester, etc., where common coal, containing much sulphur, was used as the source of the gas supplied to the consumers, but only to a limited extent. The remedy which was recommended by Dr. Wallace was the thorough ventilation of the warehouses, so as to insure that the sulphurous and sulphuric acids generated by the burning of the gas might have a sufficiently free escape into the atmosphere. He also suggested the free use of lime for whitewashing the walls of the warehouses, so that the acid vapors floating in the more or less confined air might combine with the lime. He exhibited a number of specimens of the goods which he had examined after they had been sent back by the London merchants as damaged to the manufacturers. Both in color and in strength they were seen to have suffered detriment by exposure to gaseous fumes.

Electrotypes of the Brains.

Among the novelties to be seen at the Paris Exhibition is a series of specimens of plated human brains sent by Dr. Ore, the ingenious Professor of Physiology at the Bordeaux School of Medicine. Dr. Ore has applied galvano-plasty for purposes of preservation to the brains of men and animals, and has obtained very remarkable results, the external surface presenting the hard brilliant surface of a metal, while the inner substance assumes the consistency of mastic, and is quite unalterable.

WE are indebted to Mr. H. Pollock, photographer, of Baltimore, Md., for an excellent likeness of the late Thomas Winans.

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ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, July 6, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Venus rises	2 13 mo.	Saturn rises	11 18 eve.
Mars sets	8 57 eve.	Uranus sets	9 46 eve.
Jupiter rises	8 40 eve.	Neptune rises	0 47 mo.
Jupiter in meridian	1 32 mo.		

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Alpheratz rises	9 11 eve.	Regulus sets	9 46 eve.
Algol (var.) rises	10 51 eve.	Spica in meridian	6 20 eve.
7 stars (Pleiades) rises	1 15 mo.	Arcturus in meridian	7 11 eve.
Aldebaran rises	2 34 mo.	Antares in meridian	9 22 eve.
Capella sets	8 17 eve.	Vega in meridian	11 33 eve.
Rigel rises	4 41 mo.	Altair in meridian	0 49 mo.
Betelgeuse rises	4 26 mo.	Deneb in meridian	1 41 mo.
Sirius	invisible.	Fomalhaut rises	11 51 eve.
Procyon	invisible.		

REMARKS.

Venus is directly north of *a Tauri* (Aldebaran). Jupiter's satellites will present the most interesting appearance July 8, 3h. 11m. morning. At this time but three of the satellites will be visible: the first being in the act of making a transit, and 27 minutes later appears at Jupiter's western limb; the second may be seen very close upon the west, disappearing in Jupiter's shadow one minute later, and passing from the eclipse into an occultation; the third is twice as far west of the planet as the second, and is rapidly approaching superior conjunction; the fourth is nearly at greatest western elongation, and its apparent motion is from the planet

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they are sufficiently accurate to enable the observer to find the planets.

M. M.

Positions of Planets for July, 1878.

Mercury.

On July 1 Mercury rises at 4h. 14m. A. M., and sets at 7h. 24m. P.M., keeping nearly the path of the sun, and of course it will be invisible. On July 31 Mercury rises at 7h. 1m. A.M., and sets at 8h. 20m. P.M.; it may perhaps be seen in the evening twilight, some 7° south of the place of sunset.

Mercury and Mars are in conjunction on July 22; Mercury and Uranus on the 28th.

Venus.

On July 1 Venus rises at 2h. 11m. A.M., and sets at 4h. 29m. P.M. On July 31 Venus rises at 2h. 25m. A.M., and sets at 5h. 18m. P.M.

Venus is far from us and small, but is very brilliant a few hours before sunrise.

Mars.

On July 1 Mars rises at 6h. 38m. A.M., and sets at 9h. 10m. P.M. On the 31st Mars rises at 6h. 18m. A.M., and sets at 8h. 4m. P.M.

Mars and Mercury are in conjunction on July 22. Mercury is further north than Mars.

Jupiter.

In July Jupiter will light up the evening sky. On July 1 this planet will rise at 9h. 8m. P.M., and set at 6h. 40m. the next day. On the 31st Jupiter will rise at about 7 P.M., and set after 4 the next morning.

Jupiter's four moons revolve around the planet in so short a time that they are often lost to sight by passing across the planet in transit, by getting behind the planet as in occultations, and by passing into the shadow of Jupiter and becoming eclipsed.

The 1st satellite, or the one nearest to Jupiter, will be invisible for a time, from one or the other of these causes, during the evenings of July 8, 9, 16, 17, 23, 24, 25, and 31.

The 2d satellite is less exposed to these phenomena, but will be invisible for a time on the evenings of July 2, 9, 18, and 25.

The 3d satellite is large, and a glass of very small power will show it approaching the planet on the evening of the 11th, and passing in front of it, coming out from behind the planet early in the evening of the 22d, and disappearing by going into Jupiter's shadow late in the evening on the 29th.

The 4th satellite is rarely seen to make a transit, but on July 21 it may be seen in the evening to approach Jupiter, and a good glass will show that it enters upon the disk.

Saturn.

On July 1 Saturn rises at 11h. 40m. P.M., and sets at 11h. 33m. A.M. of the next day. On the 31st Saturn rises at 9h. 38m. P.M., and sets at 9h. 30m. A.M. of the next day.

Saturn will come into better and better position for evening observers. It can easily be recognized, as it is brighter than the stars around it, and rises but very little south of east.

Uranus.

Uranus rises on July 1 at 8h. 30m. A.M., and sets at 10h. 7m. P.M. On the 31st Uranus rises at 6h. 40m. A.M., and sets at 8h. 13m. P.M.

Mercury and Uranus are in conjunction on the 28th, both of them near Regulus.

Neptune.

On July 1 Neptune rises at 1h. 5m. A.M., and sets at 2h. 39m. P.M. On the 31st Neptune rises at 11h. 4m. P.M., and sets at 40m. after noon of the next day.

Sun Spots.

The year 1878 is the time for the recurrence of the minimum period of the sun spots, and since last November only six groups of these spots have been seen. On November 30 a very large double spot was seen, which was visible for the last time on December 3. On February 5, a chain of about twelve small spots was seen near the center of the sun's disk. These were again observed on February 6 and 7. On March 5 two very small spots were seen passing off the disk of the sun. On March 15 three spots, one of them double, were seen between the center and edge of the sun, passing off. On the 16th these were again seen, but they were much fainter. On May 27 two large spots were visible. On the 29th they appeared as one single spot, and one group consisting of three individual spots. These were last seen on June 3, passing off the disk.

Removing Spots from Cloths.

Spots of Sugar, Glue, Blood, Albumen.—On white goods, on dyed tissues of cotton and wool, and on silk, simple washing with water.

Spots of Grease.—On white goods, soap water or alkalies; on dyed tissues of cotton, hot soap water. Ditto of wool, soap water or ammonia. On silk, benzine, ether, ammonia, magnesia, chalk, yolk of egg.

Colors of Varnish, Resins.—On white goods, and on dyed tissues of cotton and wool, turpentine, benzine, then soap. On silk, benzine, ether, soap; rub with care.

Stearine, Tallow.—On white goods, and on dyed tissues of cotton and wool, and on silk, alcohol at 95°.

Vegetable Colors, Wine and Fruit Stains, Red Ink.—On white goods, vapors of sulphurous acid; hot bleaching powder solution, weak. On dyed tissues of cotton and wool, wash with warm soap water, or ammonia. On silk, same; rub softly and carefully.

Alizarine Ink.—On white goods, tartaric acid; more concentrated as the spot is older. On dyed tissues of cotton and wool, weak solution of tartaric acid if the color allows. On silk, same, with care.

Rust, Black Ink.—On white goods, warm solution of oxalic acid; weak muriatic acid. On dyed tissues of cotton, repeated washings with citric acid if the color is well dyed. Ditto of wool, same; weak muriatic acid if the wool is of the natural color. On silk, no remedy.

Lime, Lyes, Alkalies.—On white goods, simple washing with water. On dyed tissues of cotton and wool, and on silk, weak nitric acid poured drop by drop, and rub with the finger the spot previously moistened.

Acids, Vinegar, Fruit Acids, Mould.—On white goods, washing with water or hot solution of bleaching powder, weak. On dyed tissues of cotton and wool, and on silk, ammonia, more or less weak, according to the tissue and the color.

Tannins, Walnut Shell Stains.—On white goods, Javelle water; bleaching powder water; concentrated tartaric acid. On dyed tissues of cotton and wool, and on silk, chlorinated water, more or less dilute, according to tissue and the color, and alternately washing with water.

Tar, Wagon Grease.—On white goods, soap, turpentine and jet of water alternately. On dyed tissues of cotton and wool, rub with pumice stone, then soap, then let stand; wash alternately with turpentine and water. On silk, same, but use benzine, and let a jet of water fall from a height upon the back of the spot.

"American" New Process Milling.

The germ of the "New Process" system of milling in America is to be found in the old French *Mouture Economique*, which is described by Rollet as follows: "The first time the wheat passes between the stones, the upper millstone, which is movable, is raised much higher than in subsequent operations, for the reason that it is sought at first, by merely crushing and rubbing the outer coating of the berry, to sever the teguments in order that they may be separated the better in the operation of bolting. After this pounding is accomplished, the first flour is taken out, and the coarsest middlings and the bran separated. The middlings are then reground on the stones brought nearer together, and this grinding gives a second white flour and second middlings. These, on being reground, likewise yield a certain quantity of white flour and some middlings. The grinding of the fourth and fifth middlings gives a flour which is called *bise* (an inferior flour), and offal called *remoulage*, which contains the hard and grayish parts near the coating of the berry." This method resulted in flour of a quality greatly superior to the ordinary system of milling practiced at the time in France, and its basis—the gradual granulation of the wheat berry by repeated operations instead of crushing it by one—forms that of the American "New Process" milling. In this respect it is similar to the Hungarian system, of which indeed it is confessedly a modification.

The preliminary operations of cleaning the wheat which is to be converted into flour holds as prominent a place in the "New Processes" as in the Hungarian system.

Not only is the greatest care taken to remove all the grosser impurities that are mixed with the grain in the process of harvesting, and the foreign seeds which result from the cotemporaneous growth of weeds with the legitimate crop, the smutty and diseased grains which exist in the general bulk, but the berry itself is subjected to a more or less energetic cleaning by a variety of processes for the purpose of removing every particle of matter which is foreign to its organism. In these processes means and appliances are adapted, not only to the work that has to be done, but to the differences in character of the materials to be operated upon. Not only do wheats differentiate into hard and soft, but the character of winter and spring sown wheat varies, physically speaking, and the cleaning agencies that may be best adapted, say for hard and spring wheats, are not necessarily equally well adapted to soft and winter wheats. The new process miller carefully studies their differences and selects his wheat cleaning machinery accordingly. In some years he finds that wheat is harder and has a thicker bran than the same variety in other seasons, and in cleaning these different varieties he deems it indispensable that his machine should be adjustable, so that the scouring should be more or less energetic as may be required. Above all he is careful not to break the bran or fracture the kernel, and machines which beat and whip the wheat are not in favor with him. He prefers the frictional action of machinery of the scouring and brushing class to those of the beating and whipping order, but in practice both classes of machines are used. The chief object is to clean the wheat thoroughly, but, at the same time, to leave the structure of the berry perfectly intact, so that when it comes to be granulated by the millstones the granulation may be as uniform and perfect as possible.

In the new process, as practiced in America, heating the wheat previous to grinding is an indispensable operation. In his work upon the subject Mr. Brown says: "Ask a first-class miller which is the best time of the year to mill wheat, and he will invariably answer you, the months of June and July. If such be the case (and of the fact there can be no doubt), what must be the condition of the wheat during the remainder of the year? It certainly cannot be in a proper state to be ground. Then what is to be done? Simply to force the conditions and prepare the wheat for milling by artificial means."

Several modes of forcing such natural conditions are used: that recommended by Mr. Brown is the passing of the wheat over a coil of pipe or corrugated cylinder in the interior of which steam is applied. The application of the heat is recommended just before the wheat enters the millstones, a separate heater being used for each pair of stones. The result is the driving of the moisture contained in the inner substance of the wheat more or less into the bran, which is thus toughened, while the flour is left dry, its color being improved, and its condition is more favorable to packing and shipping.—*The Miller.*

New Agricultural Inventions.

Mr. Joshua Davies, of Muskegon, Mich., has devised a new Grain Separator, which is intended to be used in stables to clean grain in small quantities before it is fed to horses. A blast is used, and the grain is rubbed by a flexible rubber lip as it passes out of a hopper.

A novel Scythe Snath Fastening has been patented by Mr. Manlius Hewitt, of St. Louis, Mo. It consists in constructing the swing socket with teeth upon the curved edge of its swinging end, and combining them with a bolt having beneath its head a corresponding set of teeth which mesh with the teeth of the socket plate to hold the latter rigidly in position.

Messrs. Wiley H. Tate and John E. Curtis, of Jacksonville, Ark., have patented a new Cotton Press. Two horizontally acting levers, connected with the follower levers by toggles, are operated by a windlass and ropes, so located and connected with such horizontal levers that their free ends are caused to approach each other, or separated more widely, according as the windlass is turned in one direction or the other.

A new Thrashing Machine has been invented by Mr. John E. Glover, of Lonoke, Ark. The improvement relates to a dust chimney and fly door hinged to the cap of the machine for preventing annoyance to the workmen from the dust from the cylinder. The chimney will also fold down out of the way. A gauge board is arranged to intercept the cut heads and waste grain and turn them into the shoe.

A Defense of Sludge Acid.

Professor Chandler says that the complaints of bad smells from factories in this city are groundless; that the stenches all come from the factories where sludge acid is used at Hunter's Point. Professor Seeley retorts that sludge acid is entirely innocent; that the Hunter's Point smells arise from the materials used in making artificial guano, into which process sludge acid enters only at the final stage. The real offenders are rotten fish and pork and manure. To clinch his argument, Professor Seeley lets out the secret that the chief element in the compound used by the Board of Health as a disinfectant—a compound furnished by Professor Seeley—is sludge acid! It is simply a solution of iron made by the use of sludge acid, and containing sludge oil.

Shad Hatching at Havre de Grace, Md.

Professor Baird reports that the work going on at the headquarters of the United States Fish Commission at Havre de Grace, Md., is the most extensive and important undertaken during the history of the service. At the beginning of June they were taking over a million shad eggs a day, hatching them promptly, and sending them out to the head waters of the principal streams of the South and Southwest. It is expected that from twelve to fifteen million young fish will be secured. Toward the end of July, salmon hatching will begin, and the Commission hope to make a successful solution of the problem of stocking the streams of the Mississippi valley with California salmon.

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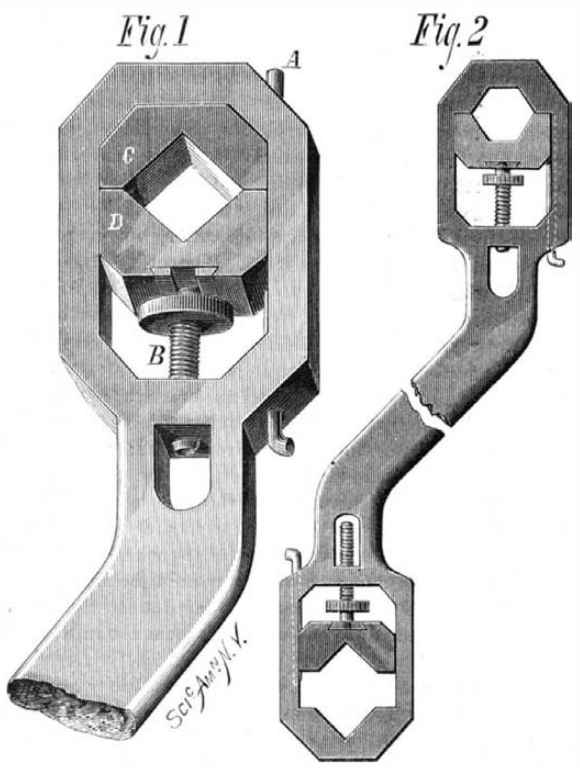
IMPROVED WRENCH.

The improved wrench illustrated herewith is so constructed as to prevent slipping and to obtain a large bearing on the nut. It is a strong and durable tool, embodying many mechanical niceties, which will be understood from the following description. The frame has two parallel sides, on the interior at top and bottom, and in it are placed two movable jaws, C D, Fig. 1, which are held therein by a



PHILLIPS' IMPROVED WRENCH.

loose wire, A, along the top, working in a groove, which is cut one half out of the frame, and the remaining half out of the jaws. This wire acts as a rib to prevent the jaws from falling out, and also as a guide for the rear jaw.

The jaw, D, is moved by means of a milled head screw, B, so as to adjust it to different sizes of nuts, the rear end of the screw passing through a tapped hole in the frame. The front end of the screw in the jaw, D, is tapered to a point so as to revolve true, and it causes the jaw, D, to travel forward with it. The backward movement of the jaw is controlled by means of a shoulder or offset cut on the screw, back of which a small slotted plate is inserted and held in place in the jaw by a dovetail. This slotted plate, in connection with the loose wire, is for the purpose of removing the jaws and inserting others to be used for nuts of a different shape.

The wrench can also be made with only one jaw movable. In this case the forward portion of the frame is fashioned to the shape of the nut, as shown in Fig. 2.

The jaws, C D, are so constructed as to obtain a bearing on four sides of the nut, or double that obtained in the ordinary wrench, thus preventing slipping, and preserving the faces of finished nuts. In hexagon nuts, and especially when heavy strain is put on a wrench, the corners are apt to be rounded. This objection is overcome in the Phillips wrench.

Patented April 16, 1878. For further particulars relative to the sale of the entire patent, address the inventor, Mr. Thomas H. Phillips, Kalmia Colliery, Orwin P. O., Schuylkill county, Pa.

Defying the Burglars.

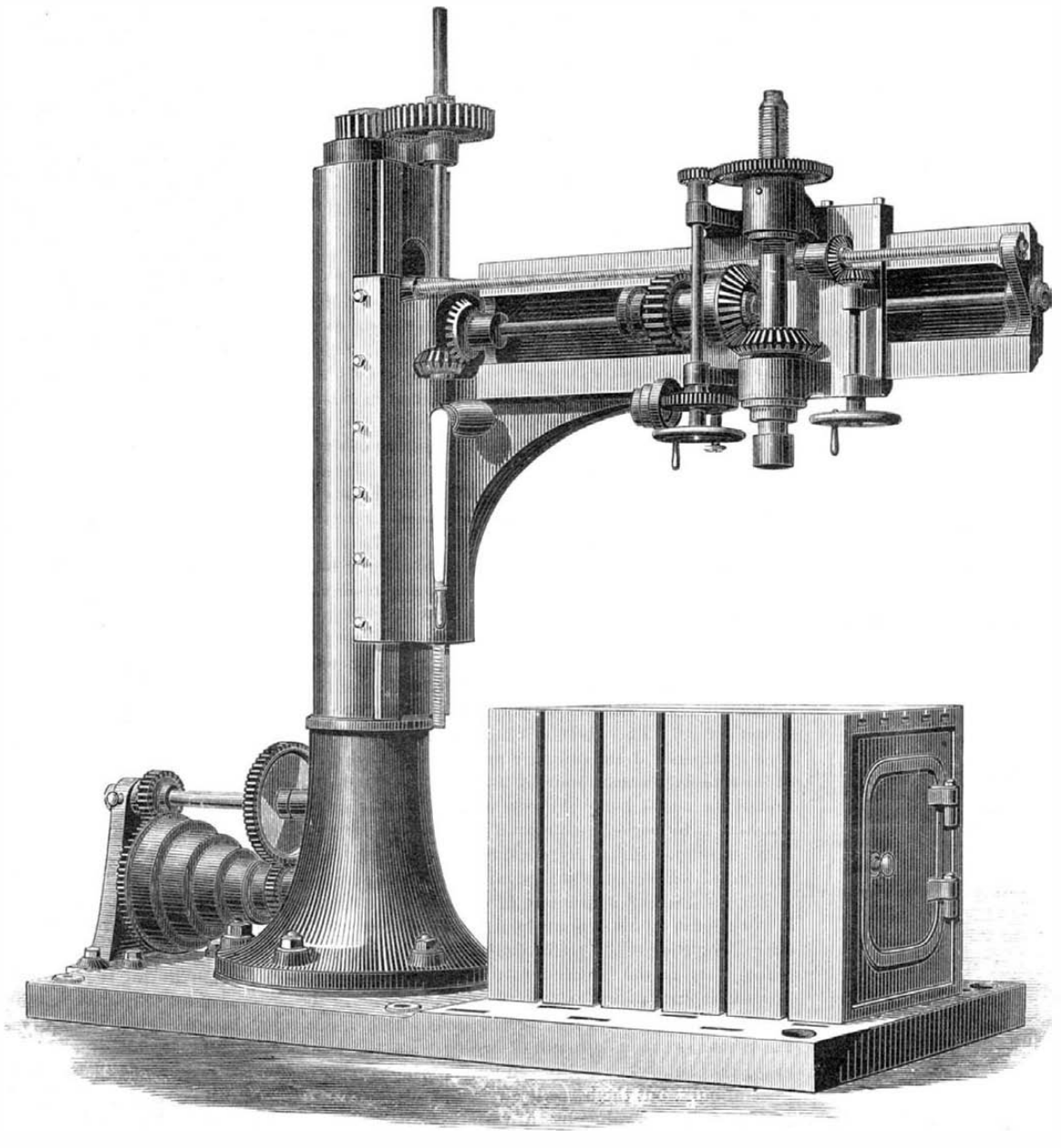
A recent patent by a Western jail builder consists in using steel bars with a wrought iron core, and, after cutting them to desired lengths and drilling them, heating them to a red heat and merging them into water while tightly held in clamps of the exact size, so as to render the edges of the bars as hard as flint, perfectly resisting the file or chisel, and impossible to be broken on account of the iron core. The clamp holds the bar so that warping is prevented.

A Dry Goods Palace Car.

A correspondent of the *American Manufacturer* says: "The United States Rolling Stock Company, at their shops in Chicago, are getting up what may be called a new departure. This is a palace dry goods car, to be used on railroads by dealers in dry goods, carrying samples along as well as stock to be delivered when sold. This car is 60 feet long, not including platforms at each end, or 66 feet long over all. Is built as light as possible and yet is strong. The construction of the body is very simple, having only two large windows on each side for lighting purposes, but at each end there is to be a stateroom for the traveling merchants to occupy nights or days, while on the roads. These staterooms are lighted by three small windows each. The inside of the car was not finished for use, so we cannot tell just how it is to be arranged, but no doubt convenient for the purpose. This car has a sub-cellar, as they call it, between the fore and aft trucks, where may be stored large quantities of domestic goods while in transit, and it has what may be called a mansard roof, or double deck, for light and ventilation, giving it the appearance of a sleeping car—except the finish. This is a new enterprise, and it remains to be seen upon trial if it shall prove a successful one."

RADIAL DRILLING MACHINE.

In the annexed engraving is shown a double-geared independent radial drilling and boring machine, exhibited at Paris by Messrs. Sharp, Stewart & Co., of Manchester, England. The machine is provided with a prolonged base plate, which carries the main standard and outer bearing for the double gear, and which is also planed to receive large articles. The table is movable, and is, when required, mounted on the base plate, as shown, so that small objects may be readily and accurately set and fixed to it. The table forms a cupboard for drills, etc. The radial arm which carries the drill spindle swings through an arc of 280°, while radially the spindle can be adjusted from a radius of 2 feet 7 inches to one of 6 feet. The shifting of the spindle carriage on the radial arm is effected by a hand wheel close to the spindle itself, so that the man in charge of the machine can make the adjustment while keeping his eye on the drill. The radial arm is also adjustable vertically by either hand or power, so as to enable the machine to take in objects from 4 feet to 6 feet in height. *Engineering*, to which we are indebted for the illustration, speaks highly of the workmanship of all the parts.

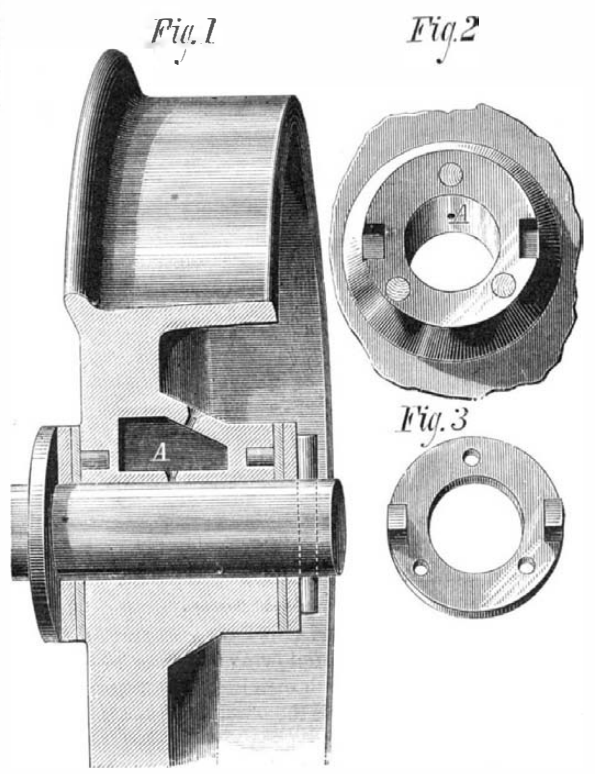


ENGLISH RADIAL DRILLING MACHINE.

IMPROVED SELF-OILING CAR WHEEL.

We illustrate herewith a new self-oiling car wheel, which is so constructed as to retain the lubricating oil, and to be easily removed when desired, so that another wheel may be substituted in its place.

Fig. 1 is a vertical section, and Figs. 2 and 3 are details of the parts. The hub is formed with an interior oil chamber, A, having an inlet on the outer side of the wheel, and



PHILLIPS' SELF-OILING CAR WHEEL.

an outlet within the hub, for the passage of the oil to the axle. Into each end of the hub are cast a sufficient number of openings of any suitable shape, into which are driven wooden plugs, and their ends made flush with the face of the hub. Next to the hub is placed a washer of gum, cork, or other suitable packing, which binds tight around the spindle; over this washer there is placed the iron washer, Fig. 3, and by means of common screws, screwed into the wooden plugs, it is drawn against the packing and an oil-tight joint thus secured. These screws pass through holes in the iron washer, and have their heads countersunk in it, so as to be flush with its face. On the iron washer are cast two lugs, which enter corresponding recesses in the hub, and in the revolutions of the wheel they serve to take the strain off the screws. The packing, while it serves to retain the oil, also prevents the admission of dirt and grit from the outside.

This device is simple and inexpensive, and, we are informed, can be adapted to wheels without necessitating any change in the axle or in the framing of the car. It allows the wheel to have free lateral motion on the axle, offers no impediment to "spragging," and in case of accident the old wheel can be removed and a new one substituted, by the simple withdrawal of the linch pin, an important feature in and around collieries where time is an object.

Patented April 16, 1878. For further particulars address the inventor, Mr. Thomas H. Phillips, Kalmia Colliery, Orwin P. O., Schuylkill Co., Pa.

Brain Feeding.

We are glad to find some small tokens that the need of "brain feeding" is beginning to be recognized by the lay public. For example, it is at length perceived that to perform intellectual work thoroughly men must be supplied with fresh air. This scrap of wisdom has been excogitated in connection with the contro-

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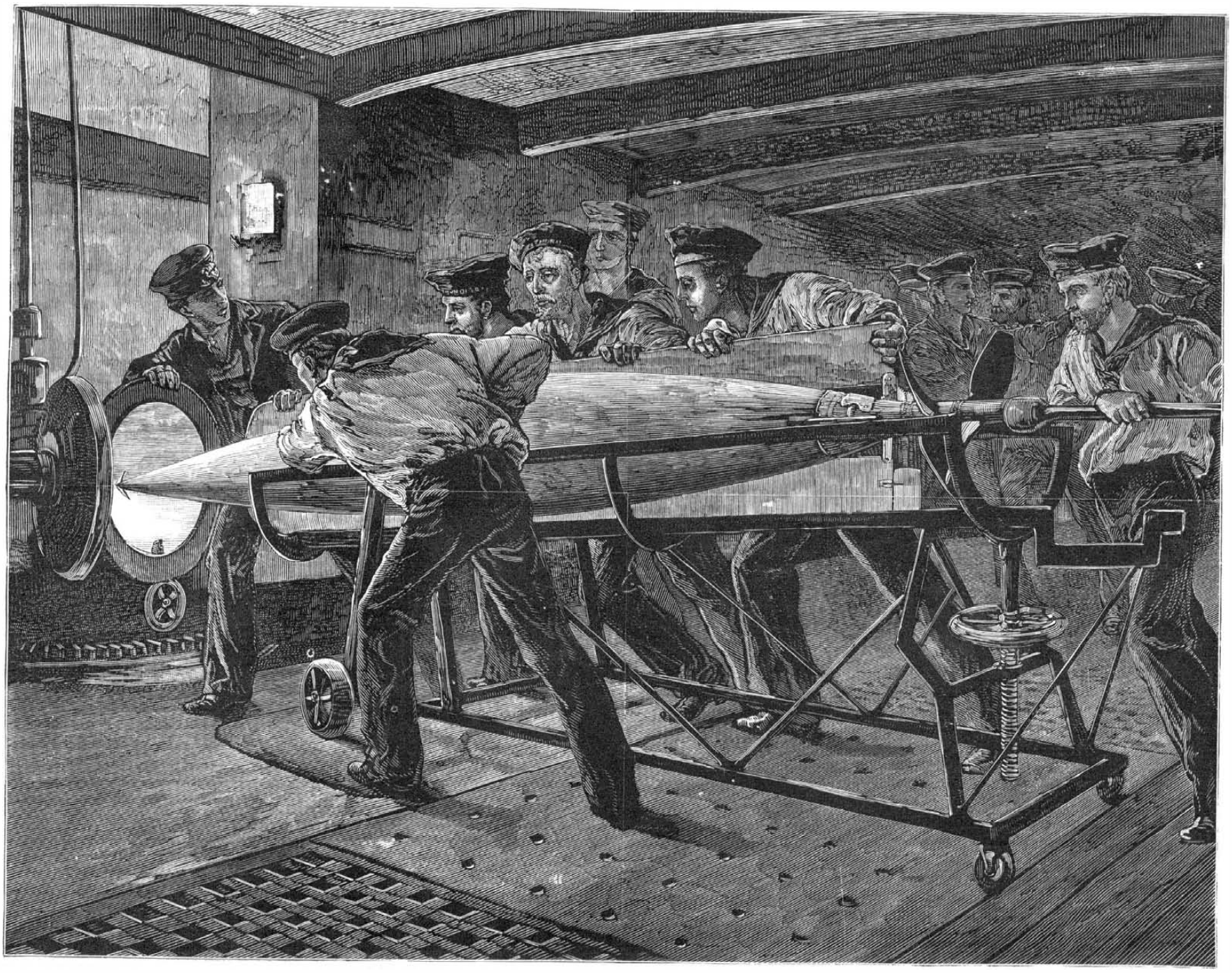
versy about the ventilation of courts of justice. It is not unreasonable to anticipate that in process of time it may dawn on the consciousness of ordinary thinkers that just as muscle is fed and trained for physical exercise, so brain needs to be prepared and sustained in mind work. It has too long been the fashion to leave the nobler part of man's organization to struggle with its own peculiar difficulties and supply its special needs as chance might enable it. This policy of neglect was all very well while the strain upon brain-power and work was not relatively inordinate. So long as the brain endured no more than its share of the penalty of labor it might be left to pick up the nutriment it required from the common store supplied to the body as a whole. The faculty of self-repair in the brain was assumed to be equal to the needs of the organ, and in health it proved adequate to the task thrown upon it. Now, however, the equilibrium has been disturbed. The press of work and the strain of worry are so great in these days of hot haste and breathless enterprise, that, except under conditions rarely established and maintained, the power of self-nourishment and repair in the mind organ is not sufficiently strong to keep it in health. It follows that it must be fed and nourished by special design. An adequate supply of oxygen is the preliminary requirement. Then comes the question of food; and, whatever else may feed the brain, workers with this organ should be assured that alcohol will not sustain it. Alcoholization and oxygenation are directly antagonistic processes; and even if alcohol be food for the brain, the organ cannot feed when the nutrient fluid circulating in its vessels is disabled from the task of conveying oxygen, which happens whenever spirit is present in more than very moderate proportions in the blood. The relief afforded by alcohol from the sense of depression produced by a lack of oxygen is, therefore, illusory. It is procured by over-stimulating an organ which is both exhausted and impaired.—*Lancet.*

THE WHITEHEAD TORPEDO.

We are indebted to the London *Illustrated News* for the annexed engraving of the launching of a Whitehead torpedo from on board ship. This weapon consists of a long cigar shaped case of thin steel built in sections well screwed together, about 17 feet long from end to end, each section 15 inches wide in its widest part, and the steel about a sixteenth in thickness. The first compartment, at the head, contains the charge of gun cotton, to be fired by the forcing of a roughened pin into a cap of fulminate, on the torpedo coming into contact with anything after it has been set in motion. The second compartment contains Mr. Whitehead's great secret contrivance, which gives the operator control over the machine, so that he can make it run at any required depth under water. The next section of the torpedo is the reservoir for compressed air, the motive power by which it runs along under water; then comes the machinery; and last of all the screw and rudders. The screw is four bladed, in appearance exactly like that of a steamer; but of the rudders there are two, one placed horizontally and the other vertically. It is the horizontal rudder which submerges the torpedo and keeps it at the required depth, until, its force being spent, it rises to the surface or sinks to the bottom, as may have been arranged in the manufacture. Outside the case nothing is to be seen but a smooth, polished surface, with a small trigger on the upper part of the air chamber, and a few screws recessed for the reception of keys. One of these, at the side of the second section, has an index attached, marked in feet, and this has merely to be turned to the required number for setting the torpedo to submerge itself and proceed along at the depth indicated. The trigger above mentioned is merely a lever for opening the air valve; and this is either done by hand when the torpedo is merely launched from a boat, or it is drawn back by a catch at the muzzle when it is shot out of a tube. In order to prevent accidents there are two safety pins, which will not allow the fuse to act. The one is drawn at starting, but the other can be so arranged as to remain in its place until a certain number of revolutions of the screw have been made, by which the torpedo is carried to a safe distance.

The preparation and use of the Whitehead "fish" torpedo on board ship may now be described. The sections of the torpedo are put together below, outside the torpedo room, and it is run along the flats on a small truck until it is beneath the hatchway in nearly the center of the battery deck, or citadel; through this it is hoisted by means of two Western's tackles and one rope tackle, and placed in a light iron framework carriage, in which it is run from the hatchway to the torpedo tube; here the carriage is placed so that the nose of the torpedo is pointing into the tube, and the tail is close to the torpedo charging column. The torpedo crew consists of six men, No. 6 being stationed at the torpedo magazine below, the remaining five men with the torpedo. Now, the torpedo being in its place, it is charged with compressed air by means of a small copper pipe, one end being screwed to the charging column, the other to a small hole in the left side of the torpedo, No. 1 of the torpedo crew opening the valves in the charging column to admit 750 lbs. of compressed air; this is the amount usually used for practice, 1,000 to 1,200 lbs. being the amount that the torpedo would be charged with for actual warfare. On the gauge showing 750 lbs., No. 1 shuts off his valves and unscrews the charging pipe, and then proceeds to set the wheel for the number of teeth ordered by the officer, the little wheel in the stern regulating the distance the "fish" is required to go, as it runs forty yards for every tooth. This wheel also pulls out a safety wedge when the torpedo has gone eighty yards from the ship. The depth having been set, and the amount of pressure in atmosphere for the required speed (which works up to twelve knots and a half an hour), the pistol, or firing apparatus, is screwed in, the safety pin is withdrawn, and the torpedo is run into the tube. The impulse tube is then put on, and the torpedo is reported, through a tube to the pilot tower, to be ready for firing. The impulse tube is an affair very much resembling a telescope in form, which is forced out by compressed air, and, pushing the tail of the fish, gives it a good start on its journey clear of the ship, the compressed air afterward forcing the telescope in again. As the torpedo is forced out a small projection on the top of the inside of the tube catches a small lever on the top of the torpedo, and throws it back. This action opens the air valve, and admits the air from the air chamber to the engines, and so sets the screws going. For practice, a boat is sent out about 200 or 300 yards from the ship, either to pull past her or remain stationary, and a shot is taken at the boat, the torpedo being set to a sufficient depth to pass under her. When the torpedo has finished its run, it rises to and floats on the surface of the water, and the boat then attaches a line to its nose and tows it back to the ship. Brought alongside, a pair of tongs is lowered over the side and placed over the center of the fish, and when fairly placed the catch that keeps the tongs open is pulled up, and the tongs close firmly round the body of the fish, the safety pin having previously been put in over the air lever, so that by any accident the engines should not be again started and the fish run away with its tongs. When the tongs are firmly secured, the torpedo is pulled inboard, and is either taken to pieces, or stowed away, or put together again and treated with another run.

A CALIFORNIAN WHEAT FARM.—The largest farmer in the State is Dr. Glenn, of Colusi county. He farms 20,000 acres. He sold his last year's wheat crop for more than $600,000. His farms are constantly being improved by fencing, the erection of good, permanent buildings, etc., and his stock of farming machinery is extensive and complete.



LAUNCHING A WHITEHEAD TORPEDO.

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EDISON'S TELEPHONIC RESEARCHES.

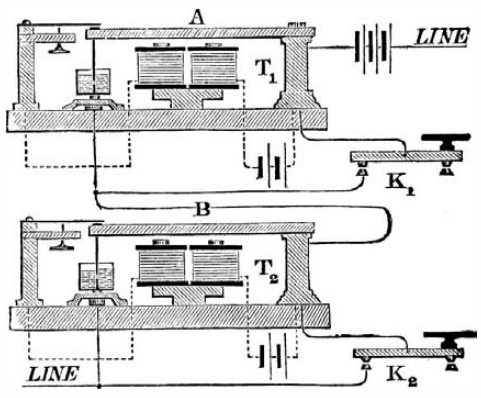
The following communication from Mr. Thomas A. Edison gives a detailed account of his researches in telephony, and is a valuable contribution to the history of the development of the speaking telephone.*

The investigations here detailed were made with a view to the perfection of a system of multiple telegraphy, which had for its basis the transmission of acoustic vibrations, with the view of producing an articulating telephone, carrying on both series simultaneously.

THE TUNING FORK SYSTEM.

In Mr. Edison's first system of acoustic transmission, which

Fig. 1.

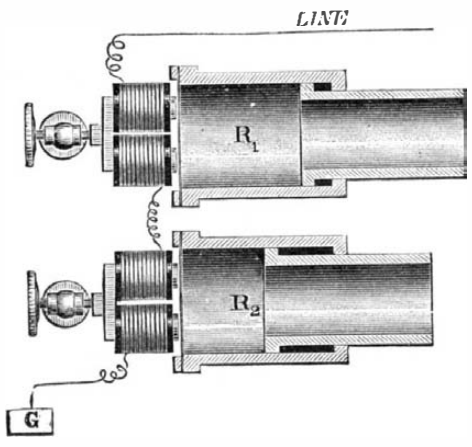


was devised in September, 1875, and is shown in Fig. 1, two tuning forks, A and B, vibrating from 100 to 500 times per second, were kept in continuous motion by a local magnet and battery, and the short circuiting was controlled by the signaling keys, K_1 and K_2. As will be seen on reference to the engraving, this system is dependent upon the varying resistance occasioned by employing a movable electrode in water, and which thus produces corresponding variations of the battery current in the line.

The receivers, R_1 and R_2, Fig. 2, were formed of telescopic tubes of metal, by lengthening or shortening of which the column of air in either could be adjusted to vibrate in unison with the proper tone of the fork, whose signals were to be received by each particular instrument. An iron diaphragm was soldered to one end of these tubes, and the latter placed in such a manner as to bring the diaphragm of each respectively just in front of an electro-magnet, which, in action, would cause them to vibrate. When the column of air in either receiver was properly adjusted to a given tone, the signals due to stopping and starting the vibrations by the distant key were very loud, as compared to other tones not in harmony with the column of air. Flexible rubber tubes, with ear pieces, were connected to the receivers, so that, in using the instruments, the head of the operator was not required to be held in an unnatural or strained position.

This system worked very well, but one defect in it was apparent from the first, and that was its continual tendency to give the operator what is termed the back stroke, which renders signals unintelligible.

Fig. 2.



While engaged in experimenting with his telephone Mr. Edison discovered that the sound waves could be transformed into electrical pulsations without the movement of any intervening mechanism.

THE INVENTION OF THE CARBON TELEPHONE.

The manner in whic t is resu t was reached is described by Mr. Edison as follows: "I first substituted a spiral spring of about a quarter inch in length, containing four turns of wire, for the rubber tube which connected the diaphragm with the disks. I found, however, that this spring gave out a musical tone, which interfered somewhat with the effects produced by the voice; but, in the hope of overcoming the defect, I kept on substituting spiral springs of thicker wire, and as I did so I found that the articulation became both clearer and louder. At last I substituted a solid substance for the springs that had gradually been made more and more inelastic, and then I obtained very marked improvements in the results. It then occurred to me that the whole question was one of pressure only, and that it was not necessary that the diaphragm should vibrate at all. I consequently put in a heavy diaphragm, one and three quarter inches in diameter and one sixteenth inch thick, and fastened the carbon disk and plate tightly together, so that the latter showed no vibration with the loudest tones. Upon testing it I found my surmises verified; the articulation was perfect, and the volume of sound so great that conversation carried on in a whisper three feet from the telephone was clearly heard and understood at the other end of the line.

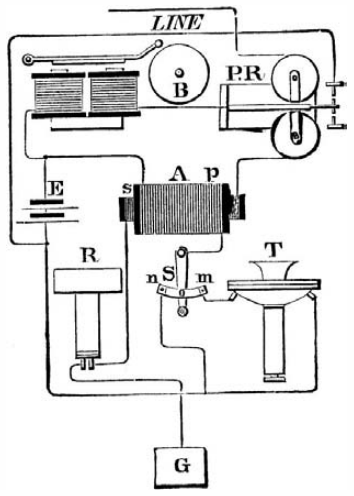
"This, therefore, is the arrangement I have adopted in my present form of apparatus, which I call the carbon telephone, to distinguish it from others. [In this way was made the discovery which Professor D. E. Hughes has lately claimed to have originated, and on which the so-called microphone is based.—EDS.]

"The accessories and connections of this apparatus for long circuits are shown in Fig. 3. A is an induction coil, whose primary wire, *p*, having a resistance of several ohms, is placed around the secondary, instead of within it as in the usual manner of construction. The secondary coil, *s*, of finer wire, has a resistance of from 150 to 200 ohms, according to the degree of tension required; and the receiving telephone, R, consists simply of a magnet, coil, and diaphragm. One pole of the magnet is connected to the outer edge of the diaphragm, and the other, which carries the wire bobbin of about 75 ohms resistance, and is included in the main line, is placed just opposite its center.

"P R is the signaling relay, the lever of which, when actuated by the current from a distant station on the line in which the instrument is included, closes a local circuit containing the vibrating call bell, B, and thus gives warning when speaking communication is desired.

"Besides serving to operate the call bell, the local battery, E, is also used for sending the call signal. S is a switch,

Fig. 3.



the lever of which, when placed at *o*, between *m* and *n*, disconnects the transmitter, T, and local battery, E, from the coil, A, and in this position leaves the polarized relay, P R, free to respond to currents from the distant station. When this station is wanted, however, the lever, S, is turned to the left on *n*, and depressed several times in rapid succession. The current from the local battery, by this means, is made to pass through the primary coil of A, and thus for each make and break of the circuit induces powerful currents in the secondary, *s*, which pass into the line and actuate the distant call bell.

"When the call signals have been exchanged, both terminal stations place their switches to the right on *m*, and thus introduce the carbon transmitter into their respective circuits. The changes of pressure, produced by speaking against the diaphragm of either transmitter, then serve, as already shown, to vary the resistance of the carbon, and thus produce corresponding variations in the induced currents, which, acting through the receiving instrument, reproduce at the distant station whatever has been spoken into the transmitting instrument.

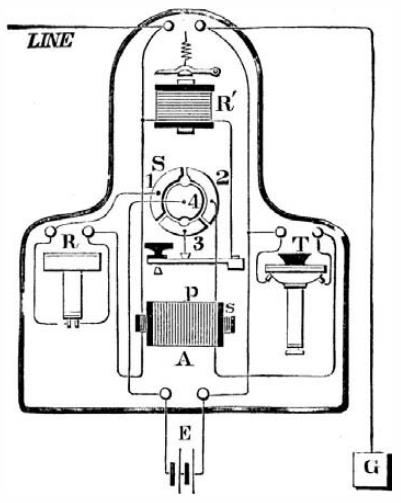
TELEPHONE SIGNALING APPARATUS.

"For lines of moderate lengths, say from one to thirty miles, another arrangement, shown in Fig. 4, may be used advantageously. The induction coil, key, battery, and receiving and transmitting telephones, are lettered the same as in the previous engraving, and are similar in every respect to the apparatus there shown; the switch, S, however, differs somewhat in construction from the one already described, but is made to serve a similar purpose. When a plug is inserted between 3 and 4 the relay or sounder, R', battery, E, and key, K, only are included in the main line circuit, and this is the normal arrangement of the apparatus for signaling purposes. The battery, usually about three cells of the Daniell form, serves also both for a local and main battery. When a plug is inserted between 1, 2, and 4, the apparatus is available for telephonic communication.

"I have also found, on lines of from one to twenty miles in length, that the ordinary call can be dispensed with, and a simplified arrangement substituted. This latter consists simply of the ordinary receiving telephone, upon the diaphragm of which a free lever, L, is made to rest, as shown in Fig. 5. When the induced currents from the distant station act upon the receiver, R, the diaphragm of the latter is thrown into vibration, but by itself is capable of giving only a comparatively weak sound; with the lever resting upon its center, however, a sharp, penetrating noise is produced by the constant and rapid rebounds of the lever, which thus answers very well for calling purposes at stations where there is comparatively but little noise."

Mr. Edison has also used direct and induced currents to release clockwork, and thus operate a call, and by the further action of these currents on similar forks at a distant station, bells were caused to be rung, and signals given. Fig. 6, page 11, shows an arrangement of this kind. A and B are two magnetized tuning forks, having the same rate of vibration

Fig. 4.



and placed at two terminal stations. Electro-magnets, *m* and m_1, are placed opposite one of the prongs of the forks at each station, while a bell, C or D, stands opposite to the other. The coils of the magnet are connected respectively to the line wire and to earth. When one of the forks is set in vibration by a starting key provided for the purpose, the currents produced by the approach of one of its magnetized prongs towards the magnet, and its recession therefrom, pass into the line and to the further station, where their action soon causes the second fork to vibrate with constantly increasing amplitude, until the bell is struck and the signal given.

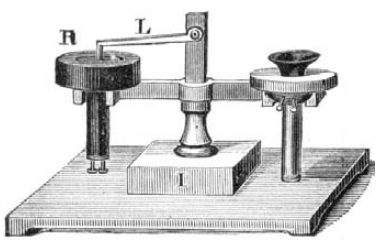
For telephonic calls the call bells are so arranged that the one opposite to the fork, which generates the currents, is thrown out of the way of the latter's vibrations.

THE ELECTRO-STATIC TELEPHONE.

Another call apparatus is represented in Fig. 7. In this arrangement two small magnetic pendulums, whose rates of vibration are the same, are placed in front of separate electro-magnets, the helices of which join in the main line circuit. When one of the pendulums is put in motion, the currents generated by its forward and backward swings in front of the electro-magnet pass into the line, and at the opposite terminal, acting through the helix there, cause the second pendulum to vibrate in unison with the former.

Fig. 8 shows a form of electrophorus telephone which acts by the approach of the diaphragm contained in A or B towards, or its recession from, a highly charged electrophorus, C or D. The vibrations of the transmitting diaphragm cause a disturbance of the charge at both ends of the line, and thus give rise to faint sounds. Perfect insulation, however, is necessary, and either apparatus can be used both for transmitting and receiving, but the results are necessarily very weak.

Fig. 5.



Another form of electro-static telephone is shown in Fig. 9. In this arrangement Deluc piles of some 20,000 disks each are contained in glass tubes, A and B, and conveniently mounted on glass, wood, or metal stands. The diaphragms, which are in electrical connection with the earth, are also placed opposite to one pole of each of the piles, while the opposite poles are joined together by the line conductor. Any vibration of either diaphragm is thus capable of disturbing the electrical condition of the neighboring disks, the same as in the electrophorus telephones; and consequently the vibrations, when produced by the voice in one instrument, will give rise to corresponding electrical changes in the other, and thereby reproduce in it what has been spoken into the mouthpiece of the former.

With this arrangement fair results may be obtained, and it is not necessary that the insulation should be so perfect as for the electrophorus apparatus. Fig. 10 shows a form of electro-mechanical telephone. Small resistance coils (1, 2, 3, etc.) were so arranged with connecting springs near a platinum faced lever, B, in connection with the diaphragm in A, that any movement of the latter caused one or more of the coils to be cut in or out of the primary circuit of an induction coil, C, the number, of course, varying with the

* Abridged from "The Speaking Telephone, Talking Phonograph, and other Novelties," by Geo. B. Prescott.

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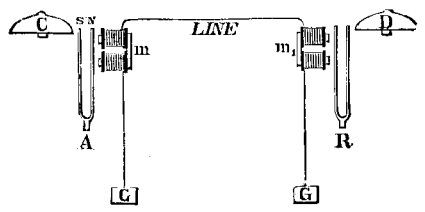
amplitude of the vibrating diaphragm. Induced currents corresponding in strength with the variations of resistance were thus sent into the line, and could then be made to act upon an ordinary receiving telephone. By arranging the

Fig. 6.

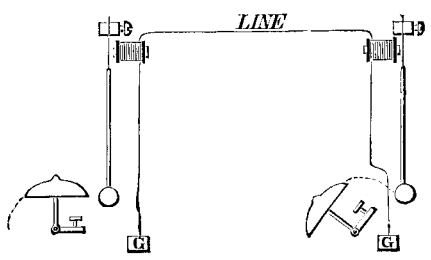


springs in a sunflower pattern about a circular lever, articulate sentences have been transmitted by this method, but the results were very harsh and disagreeable.

THE WATER TELEPHONE.

Fig. 11 shows a form of the water telephone, in which a double cell was used so as to afford considerable variation of resistance for the very slight movements of the dia-

Fig. 7.

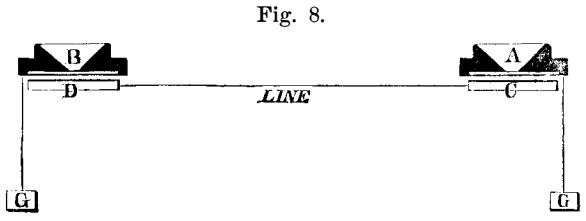


phragm. The action of the apparatus will readily be understood from the engraving, where a wire in the form of the letter U is shown, with the bend attached to the diaphragm, and its ends dipping into the separate cells, and thus made to form part of the circuit when the line is joined to the instrument at *a* and *c*.

THE THERMO-ELECTRIC TELEPHONE.

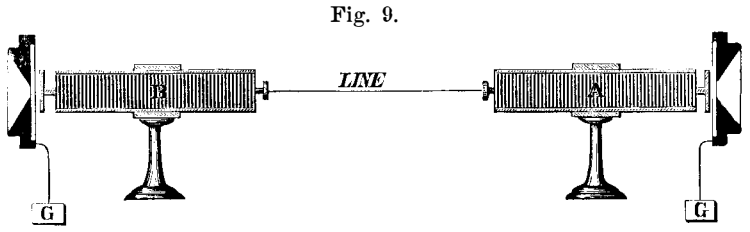
Mr. Edison is now conducting experiments with a thermo-electric telephone, which gives some promise of becom-

Fig. 8.



ing serviceable. In this arrangement a sensitive thermo-pile is placed in front of a diaphragm of vulcanite at each end of a line wire, in the circuit of which are included low resistance receiving instruments. The principle upon which the apparatus works depends upon the change of tempera-

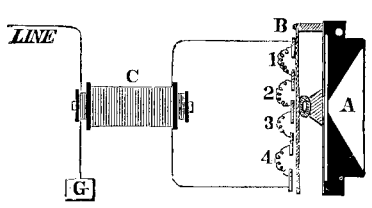
Fig. 9.



ture produced in the vibrating diaphragm, which he has found is much lower as the latter moves forward, and is also correspondingly increased on the return movement.

Sound waves are thus converted into heat waves of similar characteristic variations, and the inventor hopes to be able, by the use of more sensitive thermo-piles, to trans-

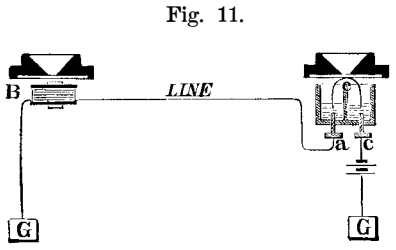
Fig. 10.



form these heat waves into electrical currents of sufficient strength to produce a practical telephone on this novel principle.

An interesting fact connected with telephonic transmission was discovered during some of his experiments with the magneto-telephone, which is that a copper

Fig. 11.



disk may be substituted for the iron diaphragm now universally used. If a piece of copper, say one sixteenth of an inch thick and three fourths of an inch in diameter, is secured to the center of a vulcanite diaphragm, the effect becomes quite marked, and the apparatus is even more sensitive than when the entire diaphragm is of copper. The cause of the sound is due, no doubt, to the production of very weak electrical currents in the copper disk.

New Inventions.

Mr. W. B. Austin, of New York city, is the inventor of an improved Chimney Ventilator, consisting of segmental spiral plates arranged upon a pivoted vertical rod, placed in a pipe at the top of the chimney, revolving in bearings in supporting cross bars. A downward current is prevented by a chimney cap of peculiar shape which deflects the wind upward.

Mr. Z. N. Morrell, of Luling, Tex., has patented a Fire Extinguisher for Lint Rooms, consisting of a tank provided with a valve in its bottom, placed on the roof of a lint room, and connected by a pipe to a perforated tank or sprinkler secured to the ceiling, The sprinkler is provided with a short pipe to which a hose can be attached.

Mr. Harvey Maranville, of Akron, Ohio, has invented Scales for testing coin and weighing small articles, more especially coin and mail matter. A beam is provided at one end with a graduated rotating disk, which carries the counterpoise, and at the other end with a scale for measuring the diameter and thickness of coin, and a pivoted platform for receiving the coin or packages to be weighed.

Mr. Joseph Dufour, of Racine, Wis., has patented a new Thill Coupling, which can be easily constructed of wrought iron. The improvement consists in constructing the axle clips, or axle irons, to which the thill irons are attached, with lateral curved arms, which serve to prevent detachment of the thills when in their normal position, but not when elevated vertically.

Mr. John Senn, of Evansville, Ill., has patented a new Remedy for Hog Cholera, which is also claimed to be efficacious in diseases of the lungs with which hogs are often affected.

Messrs. Austin Dollason and Charles L. Leonard, of Factoryville, N. Y., have improved the construction of the Front Gear for Carriages patented by C, L. Leonard, May 14, 1872, so as to prevent it from sagging or settling in the center. This is effected by means whereby more or less arch may be given to the center and side bars.

Mr. Joseph E. Chenette, of Hillsborough, Oregon, has patented a new Last. The object of the invention is to facilitate the removal of the last from the shoe and to avoid injury to the last by nailing to it pieces of leather for enlarging it at the instep and toe, and at the ball of the last.

An improved Cake Cutter and Nutmeg Grater, devised by Mr. Herbert M. Avers, of Chicago, Ill., consists of a block having at one end an interior cavity and lid for the nutmegs, and at the opposite end a handle for taking hold of the same. On the sides are cake, doughnut and biscuit cutting devices and a nutmeg grater.

Mr. David F. Hartford, of Boston, Mass., has patented a new Shears for Cutting Sheet Metal. The machine has one fixed and one movable cutter. The latter is attached to a pivoted arm, which is connected with a hand lever by means of a link, so that when the lever is vibrated the said arm is vibrated correspondingly. The lever and link enable great force to be applied to the movable knife.

A novel Hand Stamp has been patented by Mr. Sydney W. Garrison, of Memphis, Shelby county, Tenn. It consists in combining a spring-seated receding case, containing an inking pad, with a pivoted and reversible type plate sustained upon arms, so that when the housing is drawn back the platen may be reversed and its type turned outwardly from contact with the inking pad into position for pressing.

Mr. William Fenstermacher, of Shippenburg, Pa., has patented a new Side Bar Wagon, in which the body of the vehicle is supported by springs midway between the side bars and the axle. This is claimed to make the wagon very easy riding.

A new Cheek Piece for Headstalls has been patented by Mr. James W Weed, of Prescott, Iowa, which is so made as to render unnecessary a great amount of the stitching heretofore required in making headstalls.

Mr. Alexander Waldron, of New York city, has patented an improved mode of Weighting the Seats of Waterclosets in such a manner as to cause the seat to assume a vertical position immediately after use.

A new Lamp has been invented by Mr. Nicholas L. Rigby, of Winfield, Kansas, which consists of a bowl having one or more straight arms with burner cups, the bowl being made with a horizontal top and circumferential flange, to form a detachable fountain. A center valve is provided which is automatically opened when the fountain is seated on the bowl.

A new Wagon Tongue Support, adapted to relieve the necks of horses from the weight, and which is easily adjustable, has been patented by Messrs. Daniel B. Hart and William P. Webster, of West Mentor, Ohio.

Messrs. Edward Christman and John Caldwell, of Louisville, Ky., have invented an ingenious Adjustable Chair for infants, whereby accidents to the child consequent upon its own pushing, kicking, or attempting to rise or slip down are prevented.

Mr. Howard M. Moffett, of Cleveland, Ohio, has patented a new Door Bolt. It consists of guided locking bolts that are pivoted at their slotted inner ends to an eccentric cam, which is revolved by a wing-shaped key, while a raised center portion of the cam serves, in connection with the recessed inner ends, for retaining the bolts in locked position.

A new Valve Attachment for the pipes of washbasins has been devised by Mr. Francis E. Kernochan, of Pittsfield, Mass., which is so constructed as to prevent escape of sewer gas and to guard against any accidental overflow of water.

Mr. James Goodwin, of Montreal, Canada, has patented an ingenious Invalid Bedstead, which is an improvement upon that for which the same party has received letters patent, dated March 9, 1875, No. 160,667. The improvements relate to improved adjustments; to means whereby the stretcher frame may be elevated at both ends simultaneously, or at the foot only; to devices for bracing and strengthening the bedstead frame; and for stretching the ticking.

Mr. John M. Lescale, of Paincourtville, La., has patented a new Fire Escape, in which there is employed, in connection with the double grooved drum, a pendulum having an adjustable radius, so that it may be changed in position to regulate the rapidity of the descent of persons to the pavement.

A new Coffee Roaster has been patented by Mr. Jonathan Miller, of Trenton, N. J., which consists in a rotating cylinder having an inner lining of gauze wire. The sheet metal body of the cylinder and the inner gauze wire lining are held between two cast iron heads grooved concentrically to receive the same, the heads being clamped together by a nut upon a central axis, which latter is extended and bent to form the crank.

A novel Mailing Package has been patented by Mr. Wm. B. Pittman, of Vicksburg, Miss., which may be readily opened and inspected by the postmaster and as readily and securely closed against any sifting of pulverulent contents into the mail bag.

Mr. Joseph B. Underwood, of Fayetteville, N. C., has lately patented a new Coffee Roaster, in which the charge of coffee in the roasting cylinder is transferred to the cooling cylinder without exposure to the air and in an automatic manner, by the simple rotation of the same without raising the cylinders into a vertical position.

Mr. James Gainey, of Augusta, Ga., has patented a combined Filtering, Cooling, and Water Forcing Apparatus, which consists in combining a filtering apparatus and an air pressure water reservoir with the distributing pipes of the building, the said filtering apparatus being connected with the main water supply and discharging clear water into a tank having an air cushion in the top, which tank at the same time serves as a reservoir for a larger and more expeditious supply of water than could be drawn direct from the filter.

Mr. Newton J. Alexander, of Austin, Tex., has patented a Paper Bag of ordinary or any preferred construction, with a flap or apron of such form and dimensions that the powder or other substance to be put up may be deposited thereon and transferred to the bag proper by suitable manipulation of the flap and bag.

Mr. Henry Monk, of Troy, N. Y., has patented a novel Ironing Machine, which consists in providing an ironing table with a movable bosom board which may be adjusted to adapt it for properly supporting the fronts of shirts of different sizes, so that the upper portion of the fronts may be ironed in the desired manner by the ordinary heated rolls used in ironing machines. This avoids the frequent necessity of finishing them off by hand. The polishing rolls are constructed in a peculiar way to adapt them to polish shirt fronts which have not a uniform thickness of cloth.

The same inventor has also patented a pocket device, which, besides serving as a Match Safe, is adapted for igniting a match and protecting the flame thereof, thus enabling a cigar to be lighted in the street or wherever else an air blast or current would otherwise tend to prevent it.

Mr. George Banister, of Columbus, O., has patented an improved process of Tempering Steel, whereby one step of the old or ordinary process is avoided, and the cost of tempering is correspondingly reduced.

New Electric Light.

A new electric lamp, with incandescence acting in free air, has been described to the French Academy by M. Regnier. A thin rod of carbon, pressed laterally by an electric contact, and forced in the direction of its axis on a fixed contact, is traversed between these two contacts by a pretty powerful current, and becomes incandescent in this part, burning and thinning towards the extremity. As the end gets used up, the rod, continually pushed on, slips in the elastic contact, and is thus kept up against the fixed contact. The heat developed by passage of the current in the rod is greatly increased by the combustion of the carbon. An apparatus made on this principle is said to give a clear white light with four Bunsen elements. With a more powerful battery, several lamps on this system may be lit.

Quick Freight Time.

A special flour train, consisting of 25 cars and carrying 2,500 barrels, left Minneapolis, Minn., May 16, and arrived at Jersey City on the 20th. Barges and men were in waiting, and the flour was delivered to the steamer Alexandria early the next morning for exportation to London. The entire train load was shipped within four and a half days from the time of leaving the mills. It is intended to dispatch such a train weekly from Minneapolis, to make direct connection with the steamers for Liverpool and London.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Church Pipe Organs, new and second-hand, ready for delivery. Send for particulars. Henry Erben & Co., Organ Builders, East 23d St. near 2d Ave., New York.

Portable and Stationary Engines; Boilers of all kinds; 45 Cortlandt St., N. Y. Erie City Iron Works, Erie, Pa.

For best Cylinder Oil, R. J. Chard, New York.

Bolt Forging Machine & Power Hammers a specialty. Send for circulars. Forsaith & Co., Manchester, N. H.

Pulverizing Mills for all hard substance and grinding purposes. Walker Bros. & Co., 23d and Wood St., Phila.

Best Steam Pipe & Boiler Covering. P.Carey, Dayton, O.

Alcott's Turbine received the Centennial Medal.

Cornice Brakes. J.M. Robinson & Co., Cincinnati, O.

Sperm Oil, Pure. Wm. F. Nye, New Bedford, Mass.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

Painters' Metal Graining Plates. J.J.Callow, Clevel'd, O.

Boilers & Engines cheap. Lovegrove & Co., Phila., Pa.

Foot Lathes, Fret Saws, 6c., 90 pp. E.Brown, Lowell, Ms.

Notice to Inventors, Capitalists, and Ship Builders.—Assistance wanted to take out valuable inventions. Address M. K., Box 275, Shelby, O.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

National Steam Pump, adapted to every possible duty. W. E. Kelly & Bro., 46 Cortlandt St., N. Y.

Scientific American to sell—all 52 vols. A. F. Park, Troy, N. Y.

Patent Wood-working Machinery, Band Saws, Scroll Saws, Friezers, etc. Cordesman, Egan & Co., Cincin'ti, O.

Dead Pulleys, that stop the running of Loose Pulleys and Belts, taking the strain from Line Shaft when Machine is not in use. Taper Sleeve Pulley Works, Erie, Pa.

Wanted.—Exclusive control of a Patented Article to sell to Housekeepers; manufacturing cost not to exceed 25 cents. Will push a salable article on royalty. Address Lock Box 1303, Cincinnati, O.

For Heavy Punches, Shears, Boiler Shop Rolls, Radial Drills, etc., send to Hilles & Jones, Wilmington, Del.

New Patent (Eastman's) Miter Cutting Machines, specially adapted to Picture Frame making, manufactured by Witherby, Rugg & Richardson, Worcester, Mass.

2d hand Planers, 7′ x 30″, $300; 6′ x 24″, $225; 5′ x 24″, $200; sc. cutt. b'k g'd Lathe, 9′ x 28″, $200; A.C.Stebbins, Worcester, Mass.

Valuable Invention to users of Steam Boilers. See advt., page 318, May 18, '78. Address U. S. Automatic Stoker Co., No. 2 Chestnut St., Philadelphia, Pa.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Improved Wood-working Machinery made by Walker Bros., 73 and 75 Laurel St., Philadelphia, Pa.

For Town and Village use, comb'd Hand Fire Engine & Hose Carriage, $350. Forsaith & Co., Manchester, N. H.

Zero Refrigerator, with cooler. Centennial award. Send for catalogue. A. M. Lesley, 372 Sixth Ave., N. Y.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

Cheap but Good. The "Roberts Engine," see cut in this paper, June 1st, 1878. Also horizontal and vertical engines and boilers. E. E. Roberts, 107 Liberty St., N. Y.

Best Turbine Water Wheel, Alcott's, Mt. Holly, N. J.

For the best Bone Mill and Mineral Crushing Machines—five sizes, great variety of work—address Baugh & Sons, Philadelphia, Pa.

Warranted best and cheapest Planers, Jointers, Universal Woodworkers, Band and Scroll Saws, etc., manufactured by Bentel, Margedant & Co., Hamilton, Ohio.

Mill Stone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau St., N. Y.

Machine Cut Brass Gear Wheels for Models, etc. (New List.) D. Gilbert & Son., 212 Chester St., Phila., Pa.

The only genuine Geiser Self-regulating Grain Separator. Address the Geiser Manuf. Co., Waynesboro' Franklin Co., Pa.

Skinner Portable Engine, Improved, 2 1-2 to 10 H. P. Skinner & Wood, Erie, Pa.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See ad. back page.

Bound Volumes of the Scientific American.—I have on hand bound volumes of the Scientific American, which I will sell (singly or together) at $1 each, to be sent by express. See advertisement on page 14. John Edwards, P. O. Box 786, N. Y.

Friction Clutches for heavy work. Can be run at high speeds, and start gradual. Safety Elevators and Hoisting Machinery a specialty. D. Frisbie & Co., New Haven, Ct.

1,000 2d hand machines for sale Send stamp for descriptive price list. Forsaith & Co., Manchester, N. H.

For Power & Economy, Alcott's Turbine, Mt. Holly, N.J.

Address Star Tool Co., Providence, R. I., for Screw Cutting Engine Lathes of 13, 15, 18, and 21 in. swing.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburgh Steel Casting Company, Pittsburgh, Pa.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. Bliss & Williams, Brooklyn, N. Y., and Paris Exposition, 1878.

Notes & Queries

(1) R. G. McC. wishes to know how to prevent quicksand from coming into the bottom of a well. A. We think you will have to deepen the well considerably below the quicksand, going down with a tight case.

(2) J. E. T. asks for a test to determine the quality or purity of milk. A. Consult SCIENTIFIC AMERICAN SUPPLEMENT No. 73, p. 1,162.

(3) L. A. G. says: In dyeing cotton with scarlet and blue anilines, I find the colors fade and rub off; can you tell me of something to fasten them that will not destroy the brilliancy of the colors? A. The cottons are prepared for 4 or 5 hours in ¼ of their weight of sumac (or pale myrabolans), working in the cold that the yellow coloring matter may not take on the fiber. The goods may then be dyed in the aniline color beck, to which a little soap has been added. If it is not desired to use soap—as for blues which have to be acidified—the goods after treatment with sumac are steeped for one hour in a solution of sodium stannate 2½ lbs., water 87 quarts. Rinse and dye. Stannate of soda cannot be safely applied to goods containing wool or worsted; they seldom escape being more or less blackened by it.

(4) W. C. asks how pool or billiard balls are colored. A. Red: Soak for a few minutes in weak nitric acid, and then immerse in a strong infusion of cochineal in aqua-ammonia; or add ammonia water to strong solutions of magenta and picric acid (separate), and then mix the solutions. Black: Immerse the pieces in weak aqueous solution of silver nitrate for a short time, and then expose to sunlight; or steep for 2 or 3 days in a strong decoction of galls, 1 lb.; logwood, 2 lbs.; then steep for a few hours in a strong solution of iron acetate (iron liquor). Green: Dissolve verdigris in weak vinegar or very dilute nitric acid: a little sal-ammoniac may be added to this. Yellow: Steep for 24 hours in aqueous solution of acetate of lead, and after drying immerse in solution of potassium dichromate. Blue: Stain green, then dip in strong pearlash solution, or steep them for a short time in a weak solution of indigo carmine or sulphate of indigo, to which a little cream of tartar has been added. Purple: Steep in a weak aqueous solution of gold chloride.

(5) F. G. McC. writes: I am experimenting in electrotyping, but I do not succeed as I wish. I make a solution of sulphate of copper in one vessel, in which I place a sheet of copper. I use a one cell Daniell's battery. I join copper in the battery to copper in the solution, and the zinc pole of the battery to the wax matrix in the solution, and which has been covered with plumbago. The copper deposits in crystals; of course I cannot use it in that shape. Now what remains to be done? A. The current used is not strong enough; see that all the connections are tight and clean; bring the work closer to the copper anode, which should expose greater surface than the work; make the bath slightly acid; then increase your battery if necessary.

(6) J. M. L. asks how to dissolve shellac to make a varnish, other than using alcohol. A. Shellac dissolves in wood naphtha (methylic spirit), in strong hot solution of borax, and in strong aqua-ammonia; these solutions have been used as varnishes.

(7) P. A. S. asks for a recipe for a cement for mending leather belting, or for patching old boots, etc. A. (1.) Melt together equal parts of pitch and gutta percha; apply hot with pressure. (2.) Dissolve gutta percha in naphtha to the consistence of cream. See other recipes on this page.

(8) A. P. O. asks how to pack material similar to fine flour (dry) tight into barrels, without machinery. A. As we understand your meaning, we do not think it can be done, unless you can place a loose paper lining in the barrel and ram the material as the barrel is filled.

(9) J. E. L. asks: What will remove greasy substance that gathers on inside of sink pipes from dish water, etc.? A. Use occasionally a strong hot solution of caustic soda.

(10) J. L. asks for a recipe for making blacking that will raise a polish over oil or grease. A. Bone-black (best from sugar house filters, dried), 30 lbs.; sulphuric acid (commercial oil of vitriol), 2 quarts; strong malt vinegar, 3 quarts; mix and digest; then add, with constant stirring, coarse brown sugar, 11 lbs.; molasses (average New Orleans), 30 lbs.; sperm oil, 2 gallons; water, q. s. The ingredients must be well commingled by trituration, and allowed to act upon each other for several days before using.

(11) F. W. R. writes: What should be the resistance of the magnet wire of an electric engine, that is to be driven by the electric current, produced by a magneto-electric machine? A. The resistance of the magnet wire of each instrument should be about equal.

(12) E. A. asks for the cheapest method to melt horn, and what kind of moulds to use. A. Horn is softened by boiling water, and while soft may be moulded by heavy pressure. The moulds used are generally of zinc, bronze, steel or iron.

(13) J. F. C. desires to know the best cheap composition to heat and dip knives into to plate them bright, so that acid will not tarnish them. A. A bath of molten tin covered with tallow has been used.

(14) Y. & O. ask: How can we keep paste, made of flour with a little alum added, from souring? A. Add a small quantity of zinc chloride solution or a few drops of carbolic acid or oil of cloves.

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New Single Arch Bridge Proposed for the Thames River, London; with one engraving.

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Our movements are frequently taken out of their cases and placed in spurious ones, and our cases put upon worthless movements of other makers, thus vitiating our guarantee, which only covers our complete watches. *We have demonstrated by frequent assays that many gold and silver cases offered in the market are debased from 10 to 20 per cent. from the quality they assume to be.*

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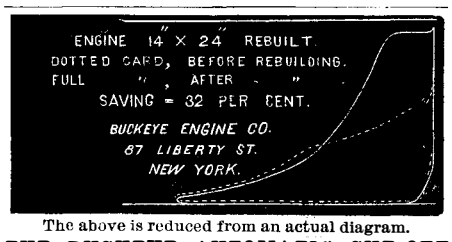
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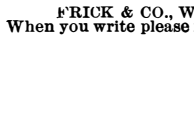

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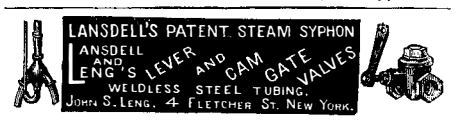
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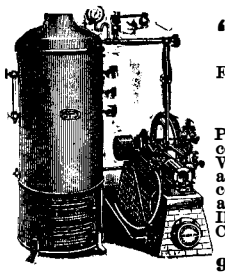

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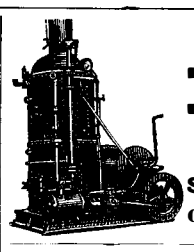

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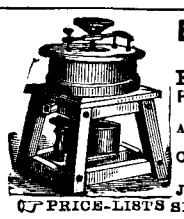

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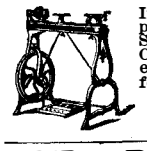

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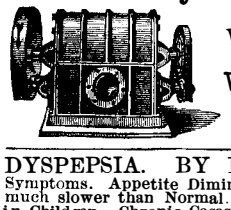

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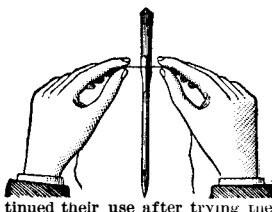

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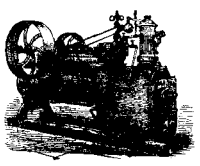

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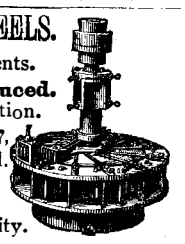

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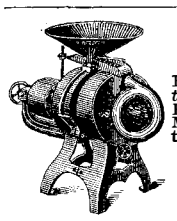

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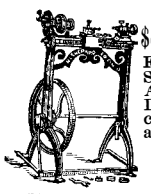

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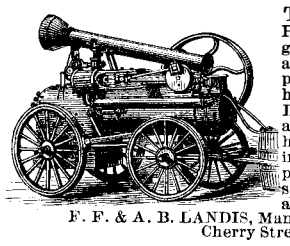

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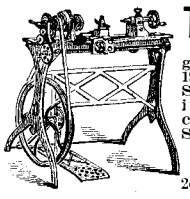

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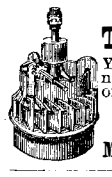

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